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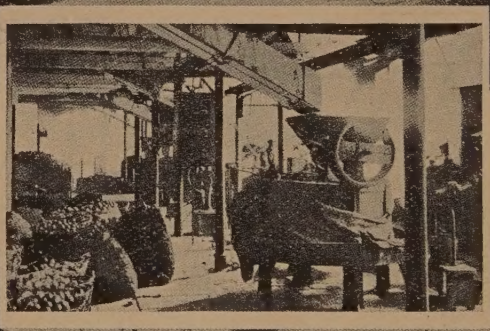

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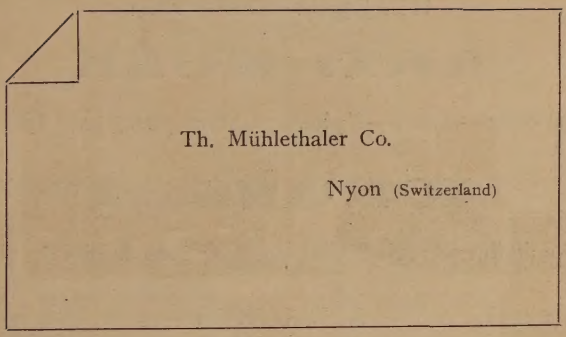

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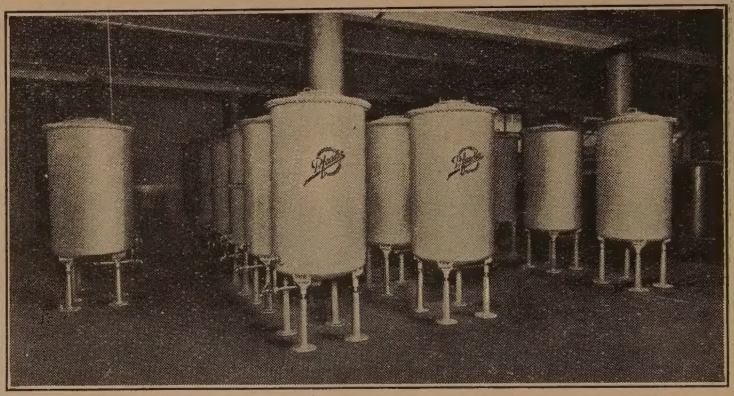

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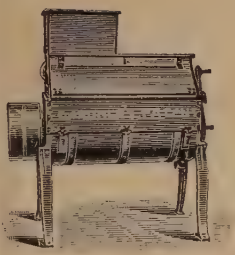

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PERFUMES AND COSMETICS

PERFUMES AND COSMETICS

WITH ESPECIAL REFERENCE TO SYNTHETICS

BY

WILLIAM A. POUCHER, PH.C.

CHEMIST-PERFUMER

Works Manager of the United Chemists Association, Ltd., Cheltenham, London and Liverpool

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1923

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AUTHOR'S PREFACE

The study of perfumes has a fascination unsurpassed by any other branch of chemistry. The researches of many distinguished scientists have gradually raised it from one of the minor arts almost to the level of a science.

Synthesis as a natural sequence follows analysis, and, whilst the synthetic perfumes at present evolved do not *exactly* reproduce the fragrance of the natural flower, they certainly attain a very close approximation, especially when blended artistically with flower absolutes. There is also a distinct pecuniary advantage to be gained by their employment, since they can be used successfully for perfuming cosmetics, soaps, etc., where price is often a very material consideration.

Furthermore, the wide range of synthetic aromatic chemicals, many of which do not occur in nature, enables the perfumer to create new odours. This is most necessary if the ever-changing tastes of the public are to be met.

As some practical account of the use of these bodies in the manufacture of perfumes and cosmetics seems to be required, I have endeavoured to supply this need in the present volume.

It is essential that the perfumer should know the raw materials he is using, and I have therefore devoted the first part of the work to a brief description of the more important of them. The varieties, sources, and properties have been included, and in many cases formulæ have been given to illustrate their use. No attempt has been made to deal fully with their chemistry or analysis, and when such data is required, reference should be made to one or other of the standard works mentioned below.

In the second part details have been given of the preparation of numerous natural and synthetic perfumes, and, in order to make the subject of more interest, I have included notes on many flowers and their varieties.

The third part embraces all modern cosmetics, together with many older ones for which there is a steady demand. It is not claimed, however, that formulæ which may occur under advertised names are identical with those in use by the manufacturers.

It has been my privilege to receive many helpful hints from the most eminent specialists in different branches of the industry, and I am especially indebted to M. Gattefossé, Editor of *La Parfumerie Moderne*, for kindly placing at my disposal much valuable matter and many photographs ; Mr. A. C. Merrin, Editor of the *Perfumery and Essential Oil Record;* Dr. Charabot, Mr. E. J. Parry, B.Sc., F.I.C., and Mr. Donald McDonald, for permission to reproduce much useful information.

I have also to thank Mr. H. Finnemore, Ph.C., B.Sc., F.I.C., and Mr. W. Wolstenholme, M.P.S., for reading proofs, Mr. H. G. Tribley, A.I.C., F.C.S., and Mr. E. W. Burton for many useful suggestions.

Several photographs and details of modern processes have been supplied by well-known manufacturers, to whom acknowledgments are tendered in various parts of the volume.

Every care has been taken to make this work as comprehensive and correct as possible. Errors and omissions, however, may have occurred, and I shall therefore be very grateful if chemists and manufacturers will draw my attention to them.

Suggestions for increasing the utility of the work will be cordially welcomed.

W. A. POUCHER.

7A SPA BUILDINGS,
CHELTENHAM,
March 1, 1923.

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PART I

A DICTIONARY

OF THE MORE IMPORTANT RAW MATERIALS AND MISCELLANEOUS BODIES, INCLUDING PIGMENTS AND DYESTUFFS OF INTEREST TO THE CHEMIST-PERFUMER

PERFUMES AND COSMETICS.

Abies Oils—*see* under Pine Needle Oils.

Abir is an aromatic powder containing curcuma, cardamoms, cloves, santal wood, etc., used by the Hindus.

Absinthe Oil—*see* Wormwood.

Absolutes are flower products of maximum concentration, and represent the whole of the perfume without natural waxes, etc. The general method of preparation is as follows : the flowers are extracted by means of petroleum ether or other volatile solvent, in a closed apparatus. When they are exhausted the liquid is run into a vacuum still and the solvent distilled off at a low temperature. The product left behind consists of the perfume together with the natural and insoluble vegetable wax, and is known as **Concrete.** The concretes are shaken in special machines with strong alcohol and the insoluble wax separated. The alcoholic solution is then cooled to below zero with the separation of any dissolved wax, this being removed by filtration. A solution of salt is added to the filtered alcoholic solution, and the perfume, which rises to the surface, is separated. If necessary the last traces of alcohol can be removed with the aid of a vacuum. These products are the so-called absolutes, and, as may be expected, are most expensive. For further details *see* Part II, Chapter I.

Acacia is the name of an extensive genus of trees and shrubs of the Mimosa section of the N.O. Leguminosæ, varying in habit from furze-like bushes to lofty trees. The acacia perfumes of commerce are usually mixtures of synthetics such as anisic aldehyde, methyl anthranilate, iso-butyl benzoate, phenyl acetic aldehyde, etc. For formulæ and

further details, reference should be made to the monograph on the subject.

Acacia Farnesiana is the source of **Cassie** (*which see*).

Aceteugenol is found in traces in clove oil and melts at 29° C. It is sometimes employed in the compounding of carnation perfumes.

Acetin is glyceryl acetate and is used as a solvent.

Acetone is a colourless volatile liquid with a sp. gr. 0·798 at 15° C. It possesses a characteristic odour, and is useful as a solvent for celluloid in the preparation of nail varnishes.

Acetophenone, when absolutely pure, is a crystalline solid melting about 14° C., but as met with in commerce it is usually liquid on account of the presence of traces of impurities. It occurs naturally in oil of labdanum resin, but may be prepared synthetically by distilling together calcium benzoate and acetate. Acetophenone is phenyl-methyl ketone, and is also known as **Hypnone**. It is a fragrant body, and may be used with good results in the preparation of hawthorn and *foin coupé* perfumes. It blends well with anisic aldehyde, terpineol, and heliotropin.

Acetum Cantharidini is a pharmacopœia preparation of the following formula :—

Cantharidin	1 gram
Acid acetic glaciale	200 c.cs.
„ „ to produce	2000 „

It is occasionally used in hair preparations.

Acetylisoeugenol is a white crystalline body melting about 80° C., and is useful in small quantities in carnation perfumes. It has been found as an adulterant of vanillin.

Achillea Millefolium is a plant of the N.O. Compositæ, commonly known as milfoil or yarrow. The leaves on distillation yield about 0·2 per cent of volatile oil, in which cineol has been identified.

Achillea Moschata, or musk-scented milfoil, is, according to Sawer,[1] a small plant found on the Swiss Alps at elevations of 5000 to 10,000 feet, and yields on distillation of its flowers and leaves an essential oil of musk-like odour. He states that it is used to perfume the liqueur known in Switzerland as "Iva."

Adeps—*see* Lard.

Adiantum Amabile, or scented maidenhair, is, according to D. McDonald,[2] an elegant stove fern from Brazil, with fronds gracefully curved ; in a young state they are slightly scented. This is one of the few ferns that possess a perceptible fragrance, and its perfume can be imitated as stated under either fougere, or coumarin (*which see*).

Adonis perfumes are compounded mainly from hydroxycitronellal, benzyl acetate, iso-butyl phenacetate, linalol and geraniol.

Ajowan Oil is distilled from the fruit of *Ptychotis ajowan*, N.O. Umbelliferæ, a herb cultivated in the East. It is used principally as a source for **Thymol**.

Alcohol, also known as *rectified spirits of wine* and *ethyl alcohol* or *hydroxide*, is obtained when fermented saccharine liquids are subjected to distillation. Various methods are used in different countries for the production of this expensive (by duty) and valuable solvent, but in all cases the general principles are the same. Sugar solutions are reacted upon by yeast, and the alcohol is separated from the fermented liquid by fractional distillation. These saccharine liquids are prepared in England principally from grain starch, in France from beet sugar, in Germany from potato starch, and in America and the East from maize and rice respectively. The alcohol from potatoes is not esteemed so highly as that from beet sugar and grain, since it contains

[1] "Odorographia" (1892), 20.
[2] "Fragrant Flowers and Leaves" (1895), 3.

a larger proportion of objectionable odoriferous substances, which are always formed by secondary reactions during fermentation. These bodies are usually known as **Fusel Oils**, and in the case of grain alcohol consist principally of *œnanthic ether* and *amyl alcohol;* in potato alcohol of *amyl*, *propyl*, *iso-propyl*, *butyl*, and *iso-butyl alcohols*, and in alcohol from molasses of *caproic*, *caprylic*, and *capric* ethers. In order to eliminate these bodies the alcohol is usually diluted with water when the insoluble oily impurities separate and are removed by filtration through charcoal. The filtrate is then fractionally distilled, the first runnings, containing aldehyde, being separated. The middle portions constitute rectified spirit, while the *tailings* contain the higher homologues of ethyl alcohol.

The rectified spirit so obtained usually contains from 90 to 95 per cent by volume of absolute alcohol and also traces of odoriferous impurities not completely separated by the first fractional distillation. The presence of these bodies is not desired by the perfumer as they would exert a deleterious influence on the fragrance of any perfume, particularly such delicate examples as eau-de-Cologne and lavender water. In order to further purify the alcohol it is sometimes treated with potassium permanganate or silver nitrate, allowed to settle, and the supernatant liquid re-distilled. The resulting product is called *Cologne spirit*, and is a colourless, transparent, and mobile liquid of slight but pleasant odour (for conversion tables *see* Appendix).

Absolute Alcohol may be prepared of about 99 per cent strength by abstracting the 5 to 10 per cent of water from rectified spirit with such substances as quicklime, anhydrous copper sulphate, etc.

Proof spirit is the standard upon which the Customs base all their calculations, and although few perfumers work to "proof" the following details may be found useful :—

At 51° F., proof spirit should weigh $\frac{12}{13}$ of an *equal measure* of water—

Specific gravity at this temperature . .	0·92308
„ „ „ 60° F. . . .	0·91984
Constitution of proof spirit by *weight*—	
Ethyl alcohol, sp. gr. 0·79381 . .	49·24
Water	50·76
	100·00
Constitution of proof spirit by *measure*—	
Ethyl alcohol, sp. gr. 0·79381 . . .	57·06
Water	46·68

Note.—These figures, although not producing 100 on paper, produce 100 by measure of proof spirit, owing to condensation and contraction of bulk on mixing.

Industrial spirit is impure ethylic alcohol to which has been added mineral naphtha or other odorous substance. It is much used in the preparation of hair washes, where the objectionable odour can be covered by suitable addition of eugenol, etc.

The *aliphatic* and *aromatic alcohols* are of considerable interest to the perfumer, as several of them occur naturally in essential oils, from which they are separated, while a number of them are now artificially prepared. The more important members of these groups are dealt with under their particular designation.

Aldehydes of both the aromatic and aliphatic series are a most important asset in the preparation of synthetic perfumes, very few of which do not contain one or more of them. Many are exceedingly powerful and are only used in traces as, for example, benzaldehyde in synthetic heliotrope, decyl aldehyde in synthetic neroli, nonyl aldehyde in rose, etc. Others such as citral and anisaldehyde have not quite such powerful notes and are used in larger proportions. Of the acyclic aldehydes the saturated straight-chain members from C_8 to C_{16} are of most importance, although methyl-*n*-nonylacetaldehyde of the saturated branched-chain series is occasionally met with, while citral and citronellal of the unsaturated branched-chain series are in common use. Of the hydroxyaldehydes, citronellal hydrate is now much employed and is becoming increasingly popular. The

properties of the different aldehydes are referred to under their particular designations.

Alizarin is a dye obtainable from madder, but now synthetically prepared from anthracene. Being a diphenol, it behaves as an acid and gives a purple-red colour in alkaline solution. It may be used for tinting lotions, etc.

Alkanet is the dried root of *Alkanna tinctoria*, N.O. Boraginaceæ, grown in the south of Europe. It contains alkannin (anchusic acid) to the extent of about 5 per cent, which colouring matter occurs in the cortex. This is soluble in oils and fats, alcohol, ether, etc., but insoluble in water. It is used chiefly for colouring oils and pomades, but owing to the amount of base absorbed by the root being excessive, it is not so economical in use as a dye. A mixture of oil scarlet and violet, in the right proportions, will give an almost identical colour for tinting lip salves, etc.

Alloxan, or mesoxalylurea, is used in the preparation of "blush" creams on account of the fact that it will impart to the skin a delicate pink tint if used in a very dilute form. It is usually dissolved in a little water and incorporated into cold cream. When applied to the skin no apparent effect is produced at once, but on longer exposure the colour is developed. If too high a percentage of alloxan is employed a purple colour is produced which may be removed by treatment with dilute nitric acid.

Allspice Oil—*see* Pimento Oil.

Allyl Iso-thiocyanate occurs in oil of mustard, is a colourless or yellow liquid according to age, and has a remarkably pungent odour. It is of little value in perfumery.

Almond Oil (Bitter) is obtained when the bruised ripe seeds of *Prunus Amygdalus*, N.O. Rosaceæ, are distilled *with water* either before or after the fixed oil has been expressed. It does not occur as such in the almond kernel, but is the result of enzyme action—the glucoside amygdalin being split up into dextrose and benzaldehyde cyanhydrin under the influence of the ferment emulsin. The HCN

radicle may be eventually removed from the volatile oil by a special process, and the commercial oil, much used for flavouring, has generally been submitted to this treatment. In perfumery this oil is not often used, but is replaced by benzaldehyde, artificially prepared and free from chlorine. It is used in small quantities in such perfumes as heliotrope and muguet.

Almond Oil (Expressed) occurs in both bitter and sweet almonds to the extent of about 45 per cent. It is a colourless to pale yellow liquid, and is useful in the preparation of skin creams and numerous other toilet articles.

Amarante is the cock's comb or prince's feather, and perfumes bearing the name usually contain a large proportion of synthetic muguet with rose, santal, musk, and jasmin to round off the bouquet.

Amaryllis is the botanical and common English name of an extensive flowering genus of bulbous herbs of the N.O. Amaryllidaceæ, chiefly natives of South America and often grown in England. The well-known belladonna lily, *Amaryllis belladonna*, and Guernsey lily, *A. sarniensis*, are natives of South Africa, and have become naturalised in Guernsey, whence their bulbs are imported to this country. Perfumes having this name are almost invariably of the lily type, with traces of rose, neroli, and aldehyde C_{14} added.

Ambergris is one of the most valuable materials used by the perfumer, and for this reason the following interesting account from the pen of M. Victor Hasslauer,[1] who is acknowledged as one of the greatest authorities on the subject, is reproduced in full. "Ambergris is from every evidence a calculus formed in the sperm-whale by the residues of digestion amalgamated with the juice of the bile or of the stomach, with the blood, and often with the excrements of the animal.

[1] "La Parfumerie Moderne" (1921), 56.

"The formation in question found in the interior of the animal gives a quality of amber different from that which is expelled by the animal. The sperm-whale is a migrating animal, going from place to place to find food, following—according to the seasons—currents which cause him to make a voyage which one can nearly call a circuit of the world. The animal furnishes a different amber, according to the part of the world in which he has been captured, or according to the spot where the amber has been found. This indicates clearly that the food absorbed by the whale influences the appearance, quality, and smell of the amber found. It is nearly always possible, from the smell and the appearance of the piece of amber, for me to indicate the part of the world where this amber was found. The pieces found in the Indian Ocean are different according to whether they have been gathered in the Eastern or Western part of that sea. Those specimens found in the Gulf of Oman, though this sea forms part of the Indian Ocean, are even different from the other two. Nearly every part of the world is able to furnish ambergris, but the qualities differ according to whether it was found in the beast, floating, or gathered on the shore after having been thrown up by the waves and exposed to the sun for several years. This last quality is certainly the rarest and the best. Ambergris may be found in different shapes ; the commonest form is spherical, the weight varying from a few grams to more than a hundred kilos. I have been in possession, in 1912, of one piece which weighed 160 kilos (it is probably the largest piece of ambergris which has been found). Pieces from 50 to 60 kilos have come into my possession several times. It is also found in slightly elongated pieces, having a cylindrical or conical shape, giving the impression of a product moulded by the intestines or by the stomach of the animal. Ambergris is often found with a central core or heart, around which concentric strata come on top of each other ; between these strata is frequently found a sort of blackish dust,

which must be produced by excrements or by the coagulated blood imprisoned between the strata ; sometimes also, several hearts or cones are found together. Ambergris, by virtue of its value, has sometimes tempted the sophisticator, but generally it is a product which is least adulterated, for its exterior aspect is characteristic and very difficult to imitate without an experienced eye being able to perceive it ; the more so, because when a small part is burnt on a hot slab, the smell which is given off is very peculiar and no product can replace the smell which is given off in burning. The exterior of a piece of ambergris is often blackish or dirty yellow, but the cracks show the following colours : golden yellow, dark yellow, reddish speckled with small grains, yellow on black, or, inversely, white, with different shades of white, brownish-purple, violet, and black. This last is nearly always found in the beast in an almost liquid state mixed with greases or oil and also excrements. The smell of it is strong but unpleasant ; however, it is capable of giving very good service in perfumery. Some ambers of a blackish-brown, and also cheaper than the large amber, are in my opinion of a very good quality and excellent to use. Some pieces of ambergris are also to be found with a chalky appearance. The purchase of a big stock of amber offers quite serious risks, for the purchaser cannot break the block to examine the inside, which may contain a large proportion of black amber, chalk, water holes of clammy, oily and liquid parts, and lose in that way a great part of its weight ; but a sufficiently practised eye can give an approximate estimation of its value according to the outward appearance of the block."

Other substances closely resembling ambergris in their physical appearance have been found from time to time floating in the ocean in localities where this valuable product is usually collected. On being examined microscopically such bodies have revealed the presence of materials of *vegetable* origin so arranged as to indicate their inclusion at the time the substance was formed, rather than extraneous matter collected while immersed in the sea.

True ambergris has a specific gravity varying from 0·780 to 0·920, and it softens about 60° C. and becomes liquid at higher temperatures. It is soluble in ether and certain volatile and fixed oils, is melted by boiling water, and volatilises at higher temperatures. About 80 per cent of it consists of **Ambrein,** together with some benzoic acid.

The odour of ambergris may be described as "earthy," but its true value lies in its marvellous fixative properties. The preparation of a strong extract and weak tincture is fully described under Fixation, but the latter form of preparation requires lengthy maturing in order that its exceptional properties may be evident when used. It is one of the finest fixatives for the old-fashioned eau-de-Cologne.

Ambres are a series of powerful fixing agents known under similar names and containing musk, civet, castor, etc. The following formula by Gattefossé[1] is typical of their composition ; other formulæ are given under fixation (*which see*) :—

Civet natural soluble	250 grams
Musk „ „	500 „
„ ambrette	20 „
„ small crystals	50 „
Vanillin	50 „
Jasmin synthetic	10 „
Rose „	10 „
Salvia sclarea	25 „
Benzoin Resinodor	80 „
Labdanum „	20 „

Ambrette Oil is obtained from the seeds of *Hibiscus Abelmoschus* (musk seed), N.O. Malvaceæ, a plant grown in India and Egypt. It is concrete at normal temperatures, and has a musky, aromatic odour. Ambrette oil is too expensive to be largely used, but in small quantities is employed as a fixer and modifier in floral bouquets. The alcohol **Farnesol** has been identified as a constituent of this oil.

[1] "Agenda du Chemiste-Parfumeur" (1918), 106.

Ambroisia Oil is the name given to the oil distilled from the seed of *Chenopodium ambrosioides*, N.O. Chenopodiaceæ, a plant native of South America. It is a red oil with a fine odour of geraniol, recalling at the same time boldo leaf oil, due possibly to the presence of traces of ascaridol.

Ammoniacum is a gum-resin exuded from the flowering and fruiting stem of *Dorema Ammoniacum*, N.O. Umbelliferæ, and imported from Persia and Northern India. Small quantities of a strong alcoholic tincture may be used in preparing opoponax perfumes.

Amyl Acetate is a liquid with a powerful fruity odour, recalling that of pear. It enters largely into the composition of artificial pear flavourings, and is often used for flavouring boiled sugar sweets. Amyl acetate has been identified as a constituent of cacao oil.

Amyl Benzoate is a colourless oil with an odour recalling slightly that of ambergris, together with a "woody" smell. It possesses remarkable fixative properties, and is useful in compounding artificial ambers (*which see*).

Amyl Butyrate is a liquid of fruity odour employed in the manufacture of apricot and banana essence. It is prepared artificially, but occurs naturally with the propionic acid ester in theobroma oil.

Amyl Heptinate, Heptine Carbonate, and Octine Carbonate are among the more recently discovered synthetics, and some considerable amount of experimental work yet requires to be done before their most advantageous use can be stated.

Amyl Salicylate is probably of more importance to the perfumer than all the other amyl esters. It is a colourless or amber yellow liquid with a characteristic aromatic odour, and may be artificially prepared from amyl alcohol and salicylic acid. It finds extensive application as the basis of all orchid and clover perfumes, while in smaller quantities it is useful as a modifier and fixer of such perfumes as

carnation, chypre and foin coupé. Amyl salicylate blends well with clary sage oil, oakmoss resin, geraniol and terpineol, and is sold under such names as "orchidé," "treflé," etc. The following formula will illustrate its use as a basis for treflé :—

Amyl salicylate	600 c.c.
Geraniol	100 „
Bergamot oil	60 „
Lavender oil—English	10 „
Ionone	10 „
Vanillin	30 grams
Coumarin	20 „
Cananga oil, terpeneless	100 c.c.
Oakmoss resin	20 „
Clary sage oil	50 „

Amylum—*see* Starch.

Androl is an alcohol isomeric with geraniol and citronellol, and has been identified in water fennel oil.

Anethol is a white crystalline body melting about 22° C., and is found in the oils of aniseed, star-anise, and fennel. On oxidation it yields aubepine (anisic aldehyde), *which see.*

Angelica Oil is distilled from the roots or seeds of *Archangelica officinalis*, N.O. Umbelliferæ, a plant indigenous to Northern Europe and Asia. It is a colourless to light brown liquid, with a pleasant aromatic odour, and is largely used in flavouring liqueurs and to some extent in perfumery. A resinoid is extracted from the plant by means of volatile solvents and is a remarkably good fixative.

Aniseed Oil—the commercial article is obtained by distillation from the fruits of *Illicium verum*, N.O. Magnoliaceæ, and is imported in leads from China, "Red Ship" brand being one of the best known. It is generally called star aniseed oil or **Badiane** (French). An oil of more delicate odour and flavour is distilled from the fruit of *Pimpinella Anisum*, N.O. Umbelliferæ, a plant grown in Spain, Russia, and Germany, but very little of it is used. The chief constituent of both oils is anethol (*which see*). Aniseed

oil is a popular flavour for dental preparations, especially if carefully blended with peppermint.

Anisic Aldehyde is manufactured on a large scale either by oxidising anethol or by methylating *p*-oxybenzaldehyde at normal temperatures. It is a colourless or straw-coloured liquid, which on exposure readily oxidises to anisic acid, and has been identified in vanilla and cassie. The odour distinctly recalls hawthorn blossom, of which perfume it is the base. In combination with sodium bisulphite it is sold as "crystallised aubepine." It is also very useful in acacia, cassie, new-mown hay, and sweet-pea perfumes.

Anisol—*see* Anisic Aldehyde.

Anisole is phenyl-methyl ether. According to the report of Schimmel & Co. (1914-15), 55, it is one of the most powerful remedies against lice.

Anozol is a proprietary odourless solvent and fixative—*see* Ethyl Phthalate.

Areca Nuts are the seeds of *Areca Catechu*, N.O. Palmæ, a palm cultivated in India. The powdered nuts are useful for making tooth powders and pastes.

Argeol is a body whose definite chemical composition has not yet been revealed. It has a floral note, recalling acacia, honeysuckle, and orange, and is recommended in these compositions.

Aromanthemes is a name given to natural flower perfumes of high concentration, and stated to be the pure product without the addition of any synthetic or other substance—these in actual practice are difficult to find.

Arrowroot is obtained principally from the rhizome of *Maranta arundinacea*, N.O. Marantaceæ, cultivated in Natal, St. Vincent, and Bermuda. When finely sifted and suitably perfumed it makes an excellent and cheap theatrical face powder.

Asafetida is a gum-resin obtained by incision from the root of *Ferula fœtida*, N.O. Umbelliferæ, a plant growing

in Afghanistan and Eastern Persia. In the crude state it has a most objectionable odour, but when the impurities are removed by maceration with alcohol and filtration, the resulting liquid, which contains the gum-resin and essential oil, is valued (in traces) as a component of certain types of oriental perfumes. Its odour is very tenacious.

Asparagus Oil has been isolated by F. Elze[1] from the small pale rose flowerets of *Asparagus Sprengeri*, N.O. Liliaceæ, a plant known as Smilax. It had an intense, almost narcotic odour resembling the fatty aldehydes. The oil was extracted by means of volatile solvents and the solid so obtained was again extracted with alcohol.

Aspic Oil—*see* under Lavender Oil.

Aubepine—*see* Anisic Aldehyde.

Aurantiène is a name given to the residual terpenes left behind in the refining of orange oil, and is used as a soap perfume.

Axungia is a synonym for lard ; it is the basis of many hair pomades.

Azalea is a botanical name for a beautiful genus of shrubs of the N.O. Ericaceæ, which are natives of North America and the East. The flowers are pretty, of various colours, and resemble those of many rhododendrons, but differ from that genus in having only half the number of stamens (five). The flowers of the common yellow azalea, *A. pontica*, are fragrant, and their perfume is imitated by the following formula :—

Geraniol	580 c.c.
Ionone, alpha	50 „
Vanillin	20 grams
Benzoin R.	100 c.c.
Jasmin	140 „
Rose	100 „
Musk ambrette	10 grams

[1] Schimmel & Co., "Report" (1918), 9.

Azelia Oil is a name sometimes given to cayenne linaloe oil—*see also* Oil of Bois de Rose Femelle.

Azur perfumes are fancy floral bouquets composed of rose, jasmin, methyl anthranilate, and linalyl acetate.

Azurone is a "parfume de fantasie," of which the base is rose and coumarin, and to which are added small quantities of orris oil, ylang ylang, violet, and jasmin, together with traces of labdanum.

Backhousia Oil is distilled from the leaves of *Backhousia citriodora*, N.O. Myrtaceæ, a tree native of Queensland. The oil, which occurs to the extent of about 0·6 per cent, has an odour recalling verbena. It is a source of citral, and for the manufacture of ionone.

Badiane—*see* Aniseed Oil (star).

Balm of Gilead—*see* Mecca Balsam.

Balm Oil—*see* Melissa Oil.

Balsamo Blanco, also known as *white Peru balsam*, and *Baume Blanc de Son Sonaté* is obtained by pressure from the fruit-pods of *Myroxylon Pereira*, N.O. Leguminosæ, but has no similarity whatever to the balsam obtained from the trunk of the tree. In appearance it resembles turbid honey, of a yellowish-white colour, and its odour recalls melilot or coumarin; on exposure this alters slightly and approaches that of cedar wood—*see* Sawer's "Odorographia," 260 (1892).

Balsam Peru is an oleo-resinous exudation from the trunk of *Myroxylon Pereira*, N.O. Leguminosæ, obtained after the bark has been beaten and scorched. Imported from Central America, it has a specific gravity 1·14, and contains about 40 per cent of amorphous resin together with odoriferous esters, including benzyl benzoate and cinnamein. It is useful in perfumery as a fixative for heliotrope, lotus, and tilleul.

Balsam Tolu is obtained by incision from the trunk of *Myroxylon toluiferum*, N.O. Leguminosæ, a tree grown in

South America. It is a soft tenacious solid which hardens with keeping. It contains about 80 per cent of amorphous resin, together with cinnamic acid, vanillin, benzyl benzoate, benzyl cinnamate, and from 2 to 5 per cent of essential oil. A filtered strong alcoholic tincture, 1 in 2, makes an excellent fixative, and as such is largely used in amber, acacia, honeysuckle, champac, wallflower perfumes, etc.

Basil Oil is obtained by distillation from *Ocimum basilicum*, N.O. Labiateæ, a herb grown in Europe, Northern Africa, and Reunion. It has a fresh, penetrating fragrance, and is useful in traces in violet, reseda, and jonquille perfumes. The oil distilled from French plants is exceptionally aromatic and most expensive.

Bay Oil is obtained from the leaves of *Myrcia acris*, N.O. Myrtacæ, sometimes called wild clove. The yield is about 3 per cent, the principal constituents being eugenol and its methyl ester. It possesses a pleasant aroma, and is an indispensable constituent of bay rum. In traces it is of value in the preparation of carnation oils.

Bdellium is the gum-resinous exudation of (1) *Balsamodendron mukul*, and (2) *B. africanum*, N.O. Burseraceæ, plants growing in India and Africa. It resembles myrrh in general properties, and when distilled yields about 7 per cent of volatile oil containing a terpene named bisabolene.

Belladonna Tincture is prepared by percolating the leaves of *Atropa Belladonna*, N.O. Solanaceæ, with 70 per cent alcohol. It contains atropine, and is dropped into the eye, thereby dilating the pupil and adding brilliance and lustre to the dioptic. Much used by actresses, and sold diluted with distilled water as "eye-bright lotion," etc.

Benzaldehyde is present in, and almost identical with, bitter almond oil (*which see*), but may be prepared synthetically from either benzyl or benzal chlorides. The artificial product is prone to contain combined chlorine, which is probably accountable for its comparatively crude odour.

Benzaldehyde free from chlorine is easily obtainable, however, and is sold as artificial almond oil. Its use in fine perfumery is confined to the heliotrope type of perfume (traces only). It is, however, largely employed as a soap perfume.

Benzoic Acid occurs in numerous essential oils and gum resins, etc., sometimes in the free state and often in the form of esters. It has a weak balsamic odour, is crystalline, melting about 120° C.,[1] and may be used as a fixative. Two varieties are in use, that prepared by subliming benzoin being superior in aroma to the synthetically prepared article.

Benzoin is a balsamic resinous exudation from *Styrax Benzoin* and other species N.O. Styraceae, trees native to Siam, Sumatra, and Java. Four varieties are met with in commerce—Siam, Sumatra, Penang, and Palembang.

Siam benzoin occurs in tears, yellowish-brown to white, brittle, melting-point 75° C. It contains up to 40 per cent benzoic acid and esters of benzoic acid, with sometimes as much as 5 per cent of vanillin. It is the only kind used in fine perfumery, and is almost completely soluble in its own weight of warm 90 per cent alcohol. If this solution is filtered bright and the alcohol recovered at a low temperature *in vacuo*, an article is produced which is similar to those sold under such names as benzoin resinodor, "clairs," etc. It is an excellent fixative, and will give body to almost any type of perfume. It is also very useful for the prefixation of alcohol (*see also* Fixatives).

Sumatra benzoin is imported in rectangular blocks which, when broken, display numerous yellowish-white "almonds." This is used in cheap perfumery, toilet preparations, and largely in medicine. In skin creams the tincture is used with or without tragacanth. *Penang and Palembang benzoins* are the poorest quality, and occur in red-brown to brown porous masses.

[1] This depends on the source—synthetic 120° to 122°, natural 120°.

Benzophenone is a crystalline fixative, melting at 49° C. It has a pleasant odour, and may be used in Eastern compounds. It may be prepared from calcium benzoate by distillation, and is also known as **Di-phenyl Ketone.**

Benzosol is Guaiacol benzoate.

Benzyl Acetate is a colourless liquid with a refreshing, fruity jasmin odour. It occurs naturally in the oils of ylang ylang, hyacinth, and gardenia, and according to Hesse and Müller is present in jasmin oil up to about 65 per cent. Benzyl acetate may be artificially prepared by acetylizing benzyl alcohol. It is one of the most useful synthetics, and being cheap, is largely used as the basis of all jasmin perfumes, being modified with methyl anthranilate and linalol. It is also useful in coreopsis, jonquille, and tuberose compositions.

Benzyl Alcohol is a colourless liquid with a faintly aromatic odour when freshly prepared; on exposure the odour becomes "almondy," owing to the formation of dibenzyl oxide and benzaldehyde, the latter being produced (according to Blanc) by auto-oxidation. This alcohol has been found naturally in the oils of tuberose, ylang ylang, champaca, wallflower, jasmin, clove, and cassie flowers, but may be synthetically obtained by heating benzyl chloride for a long period with solution of potassium carbonate. It is a valuable fixative, and enters the composition of numerous floral oils, notably those of jasmin, tuberose, and ylang ylang.

Benzyl Benzoate when absolutely pure is a solid, but traces of impurities are usually present in the commercial article, which in consequence is liquid. It is a viscous oil, with a very faint odour, and has recently found application in medicine. In perfumery it is extensively employed as a solvent for artificial musk and also as a fixative for many floral ottos. It occurs naturally in the balsams of Tolu and Peru and in the oils of tuberose, ylang ylang, and hyacinth.

Benzyl Butyrate is an oil with a characteristic buttery odour, and is useful for modifying jasmine perfumes.

Benzyl Cinnamate is a crystalline compound melting about 32° C. It occurs naturally in Peru and Tolu balsams, etc., and has a heavy, persistent aroma. It is useful in preparing perfumes of the oriental type, and is also employed in compounding ambrè Colognes and lavender waters. It may be prepared artificially.

Benzyl Formate is an oil having an odour of jasmin, but harsher and more pronounced than the acetic acid ester. It is used in jasmin compounds, but oils containing it require long maturing. In traces it is also useful in tuberose compounds.

Benzyl Propionate is a liquid whose odour is finer and sweeter than the acetic acid ester. If mixed with the latter in the proportion of about 20 per cent it will give to jasmin ottos a freshness and originality.

Benzyl Salicylate is a colourless liquid with a faint odour. It is a useful fixative.

Benzyl Succinate is a white or faintly yellowish-white, crystalline, odourless, almost tasteless powder, permanent in the air and melting at 45° C. It resembles the benzoate in its therapeutic action, and when dissolved in a very volatile oil will give it greater persistence.

Benzyl Valerianate is a liquid having a slight but characteristic valerian odour, and is stated to be present in some brands of artificial rose and opoponax ottos.

Benzylidene Acetone is obtained when benzaldehyde and acetone are condensed by the aid of dilute caustic soda. It is a crystalline substance, melting at 42° C., and possessing a powerful and persistent floral odour, recalling that of sweet-pea. It has found a permanent place in perfumery, and is the predominating note in all sweet-pea ottos. About 5 per cent in combination with iso-butyl benzoate, hydroxy-citronellal, terpineol, and heliotropine, together

with traces of methylnonylketone, give a remarkable representation of the sweet-pea aroma. It is also recommended in traces in eau-de-Cologne, jonquille, and lavender water.

Benzyl Iso-eugenol does not appear to have found the favour in England that it commands on the Continent. It occurs either as a light flocculent powder or in fine lamellæ, the former melting at 54° and the latter at 59° C. A liquid form has recently been introduced. It is a very good fixative for carnation ottos up to about 10 per cent, and is recommended also in synthetic rose, while it possesses the unique property of giving "body" and tenacity to violet compositions. The benzoyl ester has similar properties; the odour differs slightly and the melting-point is higher—104° to 105° C.

Bergamiol is a pseudonym for linalyl acetate.

Bergamot Oil is obtained from the fresh peel of the fruit of *Citrus aurantium* (Bergamia), N.O. Rutaceæ. It is nearly all produced by expression, and machines are largely used for this purpose. The tree flourishes exclusively in the southern part of the province of Reggio-Calabria, and the fruit is collected during November and December. The green colour of the oil is due to chlorophyll, and not as frequently supposed to the presence of copper. It contains from 35 to 40 per cent of linalyl acetate, and is liable to skilful adulteration, the principal substances used being terpinyl acetate, glyceryl acetate, and ethyl citrate. The use of the oil in perfumery is so well known that very little reference to it is necessary here. It finds a prominent place in the formulæ of eau-de-Cologne and lavender water, and will blend well with almost any synthetic. The terpeneless oil is very useful and is about thrice the concentration of the natural product. An excellent article on this oil appeared in the "P. and E.O.R." special number of June 12, 1922, p. 230, to which reference should be made for further details.

Beta Naphthol Butyl Ether is a crystalline substance melting at 31° C., and is sometimes described as **Fragarol,**

but is not so well known as the two following ethers. Fragarol has a weak odour recalling that of strawberries, and finds a place in the formulæ of some Cologne ottos owing to its milder perfume.

Beta Naphthol Ethyl Ether has similar properties to those of the methyl ether, excepting perhaps that the odour is more delicate. The melting-point is lower—37° C. Weight for weight it is about equal to neroli oil in strength, and is known as **Nerolin II. or Bromelia.**

Beta Naphthol Methyl Ether occurs as white scales melting at 72° C., slightly soluble in alcohol, and having an odour (in dilute solutions) resembling Neroli oil. It is known in commerce under two names, **Nerolin and Yara-Yara.** It is largely used in soap perfumery, and is employed in the compounding of cheap Colognes. It is sometimes offered for sale as Cologne powder.

Betel Nut—*see* Areca Nut.

Betol is naphthol salicylate.

Betula Lenta, oil of sweet birch, distilled from *Betula lenta*, N.O. Betulaceæ, consists almost entirely of methyl salicylate. It is nearly identical with the oil from *Gaultheria procumbens*, N.O. Ericaceæ, and is frequently sold as such. It may be used in the preparation of synthetic cassie oil, and is also employed in compounding new-mown hay perfumes.

Betuline is a proprietary crystalline fixing agent, melting at 33° C., and is useful in artificial amber, e.g. (after "Parfumerie Moderne"):—

Fixol 100 per cent	500 grams
Betuline crystals	100 „
Dianthor „	100 „
Rose de France	100 „
Anozol	200 „

Beure de Violettes is a synonym for concrete oil of orris.

Bigarade—*see* Neroli Oil.

Binders for Perfumes—*see* chapter on Fixatives.

Bisamin is a proprietary fixing agent.

Bixine is a red colouring matter obtained from *Bixa Orellana*. It is a synonym for annatto.

Bois de Rose Femelle is the name usually given to cayenne linaloe oil, distilled in French Guiana from species of either Burseraceæ or Lauraceæ. It is a sweet-smelling liquid and the source of the finest quality linalol. It enters the composition of the lily and lilac type of perfume, and on account of its tenacity is useful as a fixative for May blossom, corylopsis, and rose perfumes. The terpeneless oil is about three times the concentration of the natural product—*see also* Linaloe Oil.

Boldo Leaf Oil is distilled from the leaves of *Peumus Boldus*, N.O. Monimiaceæ, a fragrant tree growing in Chili and yielding about 2 per cent. of volatile oil. The odour recalls cymene.

Bornyl Acetate occurs naturally in many oils, notably in that of pine needles. It may be obtained synthetically by heating borneol with anhydrous acetic acid in the presence of some sulphuric acid. Bornyl acetate has a refreshing odour of pines, and on this account is much employed in theatre and cinema sprays. The butyric formic, iso-valerianic, and propionic acid esters are also met with in commerce and differ only slightly in odour value. The formate is sweeter, while the butyrate is more camphoraceous than the acetic acid ester.

Boronia is a genus of shrubby trees from Australia, cultivated in England as green-house plants ; although the flowers are comparatively insignificant, the whole group have peculiarly scented leaves. D. McDonald[1] states that "the flowers of *Boronia megastigma* are fragrant and impregnate the air for a great distance with a ravishing

[1] "Fragrant Flowers and Leaves" (1895), 16.

perfume of lemon and rose." An oil has been distilled by M. G. Smith from *B. pinnata*. This is amber coloured and the odour is aromatic, recalling that of geraniol and its acetic acid ester.

Bouleau—*see* Betula Lenta Oil.

Bouvardia oils are made up from benzyl acetate, linalol, methyl anthranilate, and hydroxy-citronellal—*see* the Jasmin Monograph.

Bromelia—*see* β-Naphthol Ethyl Ether.

Bromstyrol occurs in commerce as a colourless to dark brown liquid possessing a harsh, powerful hyacinth odour. It may be prepared from styrolene, C_8H_8, but has little use in fine perfumery, being replaced by phenyl acetic aldehyde. It is, however, much used as a soap perfume.

Buchu Oil is distilled from the leaves of several species of *Barosma*, N.O. Rutaceæ, the yield being about 2 per cent and the principal constituent diosphenol. The oil possesses a very pleasant aroma, but does not appear to be much used in perfumery.

Bupleurol is an alcohol with a faint, rose-like odour obtained from the essential oil of *Bupleurum fruticosum*, N.O. Umbelliferæ.

Butyric Ether—*see* Ethyl Butyrate.

***n*-Butyl Phenyl Acetate** is a colourless liquid, having a carnation-like odour. Its application is similar to that of *iso*-butyl phenacetate (*which see*).

Bisabol is the Bombay vernacular for Bdellium (*which see*).

Cacao Butter is a concrete oil melting about 32° C., and is obtained by pressing the warm crushed seeds of *Theobroma Cacao*, N.O. Sterculiaceæ. It is used in vanishing creams, and in moulded sticks, suitably perfumed, is sold as a grease paint remover. Medicinally it is used as the base of certain suppositories and pessaries.

Cadinene is found in oil of cade, which is obtained by the destructive distillation of the wood of different species of conifers, etc. It has been identified in the essential oils of cedarwood, santal, patchouli, etc., but is not extensively used in perfumery. It has been recommended as a useful constituent in synthetic ylang ylang oil up to 5 per cent.

Calamine is a form of zinc carbonate, which may be colourless or pale pink. It is useful in lotions for the prevention of sunburn.

Calamus Oil is obtained by distillation from the rhizome of the sweet flag, *Acorus Calamus*, N.O. Aroideæ, a plant growing largely in Europe, and found on the banks of rivers. The oil has a soft, mellow fragrance and is useful in chypre compositions.

Camelia—synthetic ottos bearing this name are usually compounds of linalol, ylang ylang, and iso-eugenol, blended with jasmin, orange flower, and musk.

Camomile Oil is obtained by distillation of the dried flowers of *Anthemis nobilis*, N.O. Compositæ. It is a pale blue or greenish-blue liquid with the characteristic odour of the flowers, and has been recently introduced as a perfume in shampoo powders. The oil is believed to tint the hair when thus applied.

Camphor occurs in the wood of *Cinnamomum camphora*, N.O. Lauraceæ, a tree grown in Japan. It may be synthetically prepared by the oxidation of borneol. It is not much used in perfumery, excepting perhaps when mixed with hard paraffin and sold as "camphor ice."

Canada Snake Root Oil is obtained from the roots of *Asarum canadense*, N.O. Aristolochiaceæ, a plant found in Canada and the United States. It has a pungent aroma, recalling a mixture of patchouly and ginger, and traces of it are used for imparting special tones to eau-de-Cologne, etc. (It is stated to be much used by American perfumers for this purpose.)

Cananga Oil is distilled from the flowers of *Cananga odorata*, N.O. Anonaceæ, a tree cultivated in Java and Southern Asia. In India it is cultivated at Bantam. The flowers appear when five years old and blossom twice annually, yielding about 60 kilos of flowers. 350 kilos are required to produce 1 kilo of oil.[1] It has a sweet pleasant aroma, but not by any means as fine as the oil distilled from the same tree grown in the Philippines and known as ylang ylang oil. This is a remarkable example of the difference in odour value, due probably to the soil or climatic conditions under which the plant grows. The terpeneless oil, which is from two to three times the strength of the natural oil, is sometimes sold as synthetic ylang ylang. It is undoubtedly a useful asset in preparing this oil as the following example will show :—

Linalol	300 c.c.	
Phenyl ethyl alcohol .	100 „	
Methyl para cresol . .	5 „	
Methyl anthranilate . .	80 „	(melted)
Nonyl alcohol . . .	20 „	
Cananga oil, terpeneless .	500 „	

It is also very useful in violet compositions and oriental bouquets.

Canarium Luzonicum Oil—*see* Elemi.

Canella Oil is distilled from the bark of *Canella alba*, N.O. Canellaceæ, a plant grown in the West Indies. Its odour is very aromatic, and recalls that of cinnamon and clove simultaneously. It is used in eastern bouquets.

Cantharidin is a tasteless, odourless, crystallisable solid, only sparingly soluble in water and obtained from cantharides, the dried beetle *Cantharis Vesicatoria* and other blistering beetles. It is used in hair preparations, and for this purpose is usually dissolved in chloroform or æther before being added to the bulk.

[1] Schimmel & Co., "Report" (1919), 82.

Caraway Oil is obtained from the seed of *Carum Carui*, N.O. Umbelliferæ, a plant cultivated in Europe and Northern Africa. The English oil is considered to have the finest aroma. In small quantities it is useful in combination with other oils for flavouring mouth washes. **Carvone** is the principal constituent.

Cardamon Oil is generally distilled from the seeds of Ceylon cardamons, *Elettaria Cardamomum*, N.O. Zingiberaceæ, which are met with in commerce in their pericarps. It is not largely used in perfumery but has been recommended in traces in synthetic lily of the valley ottos and eau-de-Colognes.

Carmencita—Bergamot and Terpineol compositions.

Carmine is prepared by precipitating decoctions of cochineal with alum, gelatine, etc., and is readily soluble in alkaline liquids. It is frequently used in toilet preparations, lip salves, rouges, etc. For some articles it is replaced with advantage by a dye known as **Carmoisine**, certain varieties of which are not altered in acid solution.

Carnation, or *Dianthus Caryophyllus*, is one of our most beautiful garden flowers whose perfume is exceedingly difficult to imitate without the use of natural œillet extract. Numerous carnation oils are in the market, and these have either eugenol or iso-eugenol as their base. The best fixative for this type of perfume is benzyl-iso-eugenol. For further details reference should be made to the monograph.

Carrageen, or Irish moss, is the whole plant, *Chondrus crispus*, N.O. Gigartinaceæ. It contains about 90 per cent mucilage, and on this account is used as the basis of cheap skin creams where tragacanth would be too expensive. For this purpose the plant is boiled with water for half an hour and then strained—the liquid setting to a jelly when cold.

Carvacrol is a phenol isomeric with thymol, and occurs in origanum and thyme oils.

Casein is a solid protein present in milk. It is used as a basis for some types of vanishing creams and rolling massage creams.

Cassia Oil, also known as "Chinese cinnamon oil," is distilled from the plant *Cinnamomum Cassia*, N.O. Lauraceæ, the leaves and twigs being used for the best quality product. It is usually bought on its cinnamic aldehyde content, which for the finest oils should be 85 to 90 per cent. This aldehyde readily oxidises to cinnamic acid which attacks the lead container. Cassia oil, therefore, is prone to contain lead and should be rectified before use. This oil is used for perfuming soaps of the brown windsor type, and should not be confused with **Cassie**, the product of acacia farnesiana (*which see*).

Cassie is a well-known and highly esteemed perfume-giving flower, the concrete or pomade being obtained from *Acacia farnesiana*, N.O. Leguminoseæ, a shrub cultivated in the South of France. There is a forest of bushes in Syria, near Beyrouth, where a works has recently been established by a well-known French firm. The odour of the fresh, golden, globular flowers recalls both violet and orange blossom simultaneously. Farnesol and methyl salicylate, among other substances, have been detected in the extract, and the pomade is much used in compounding violet bouquets. For formulæ and other details reference should be made to the monograph.

Castoreum, or castor, is the dried preputial follicles and their secretion obtained from the beaver, *Castor Fiber*. The odour is strong and objectionable, recalling birch tar, but in dilute solution is much more pleasant. It is used principally as a fixative and is employed in compounding artificial ambers. The two pear-shaped sacs are found in both male and female, and should not be confounded with the testicles of the male genital organs. There are two commercial varieties, Canadian and Russian. In order to prepare castor in the form of a strong tincture the secretion is removed from the bags and rubbed down with an equal weight of orris root

powder. This mixture is macerated for six months with about ten times its weight of alcohol 90 per cent and then filtered. (*See* the special extraction process described in the chapter on Fixation.)

Castor Oil is expressed from the seeds of *Ricinus communis*, N.O. Euphorbiaceæ. Mixed with alcohol, perfumed and tinted, it is sold as a hair fixer.

Cayenne Linaloe Oil—*see* Bois de Rose Femelle.

Cebanol is a novelty, recommended as a substitute for musk.

Cedar Wood Oil is obtained by the distillation of the wood of *Juniperus virginiana*, N.O. Pinaceæ, a shrub or tree grown in North America. In perfumery it is used in cheap violet compositions and as an adulterant of ionone.

Cedrat Oil, as met with in commerce, is usually a mixture of *Citrus* oils. The citron, from *Citrus medica*, N.O. Rutaceæ, yields an oil from the peel, which resembles lemon oil.

Celluloid is an intimate mechanical mixture of camphor and pyroxylin, prepared by partially dissolving each substance in a suitable solvent (*e.g.* carbon tetrachloride), mixing, and subjecting to pressure. By dissolving 1 per cent of white celluloid in a mixture of acetone and amyl acetate, suitably perfumed, an excellent **Nail Varnish** is produced.

Cera Alba, or white beeswax, is yellow beeswax which has been bleached either by exposure to light or by chemical means. It is useful in several toilet preparations, and indispensable in preparing cold cream (*which see*).

Ceresine is the solid residue left behind when petroleum evaporates. It occurs very largely in Galicia, and in the crude state is mixed with earthy impurities. It is purified by repeated treatment with sulphuric acid, and is largely employed in the manufacture of boot polishes. It is also useful in cosmetic creams, lip salves, etc. The best varieties melt about 50° C.

Cetaceum, or spermaceti, is a concrete fatty substance obtained from the head of the sperm whale. It is of value in the manufacture of both liquid and solid creams and is the basis of many lip salves.

Champaca Oil is obtained from the flowers of either *Michelia champaca* or *M. longifolia*, N.O. Magnoliaceæ, a plant growing in the Philippines, Java, and Northern India, where it is believed to be sacred to one of the Hindu gods. The flowers of the former variety, which have a delicious fragrance, are pale lemon-coloured and tulip shaped, while those of the latter are white. It appears doubtful whether commercial oils are distilled from the yellow flower alone, or from a mixture of the two, with a possible addition of ylang ylang blossoms. Several bodies have been identified by different workers, and among the more important may be mentioned: Iso-eugenol, benzyl alcohol, linalol, geraniol, and methyl anthranilate. The odour of the oil recalls basil. The majority of champaca perfumes are prepared artificially from the above-mentioned bodies, and these may be suitably fixed by means of ambrette oil, benzyl iso-eugenol, vanillin, olibanum, or tolu balsam.

Champaca Wood Oil, *see* Guaiacum Wood Oil.

Cheiranthin is a proprietary viscous oil sold as a base for wallflower and œillet compositions. It appears to consist principally of iso-eugenol and iso-butyl phenyl acetate.

Chèvrefeuille—*see* Honeysuckle.

Chinambrol is a proprietary fixative of the amber type.

Chloranthus Inconspicuus is a Chinese shrub, and its blossoms are known as the "pearl of flowers." They are used for perfuming tea and in the manufacture of modern Chinese cosmetics.

Chlorophyll is the green colouring matter occurring in the leaves and stalks of plants, from which it is extracted by percolation with a volatile solvent, this being eventually removed by distillation at low temperatures, or by treatment

with dilute alkalis and precipitation by mineral acids. Chlorophyll is not easily replaced by a dye.

Chrysol is a name given to the principal constituent of chrysanthemum oil.

Chypre compounds are usually very persistent, and almost invariably contain sassafras with clary sage and oakmoss resin.

Cineol, also known as **Eucalyptol,** is a constituent of many essential oils, notably those of eucalyptus, cajuput, and spike lavender. It is used to some extent in dental preparation (also medicinally).

Cinnamic Acid is found as such, and also in combination, in several essential oils and gum resins, notably Cassia and Storax. It may be synthesised by heating together benzal chloride and sodium acetate, and is a crystalline body melting about 132° C. It has a pleasant balsamic smell and is used as a fixative in Eastern perfumes.

Cinnamic Alcohol, as generally met with in commerce, is a pleasant hyacinth-like oil, although in the pure state it is crystalline and melts at 33° C. It occurs as ester in several essential oils, in balsam of Peru and storax. It is useful in combination with phenyl acetic aldehyde in preparing hyacinth perfumes, while in artificial rose otto it is of value. It may be prepared synthetically, and its methyl and ethyl esters are remarkable fixatives. Cinnamic alcohol is also known as **Styrone.**

Cinnamic Aldehyde is prepared synthetically or may be separated from cinnamon or cassia oils by means of sodium bisulphite. Compared with cinnamon oil it is a liquid with rather a crude odour, but finds a place in soap perfumery.

Cinnamon Oil is distilled from the bark of *Cinnamomum zeylanicum,* N.O. Lauraceæ, a tree native of Ceylon. It is a pale yellow to brownish-yellow oil, possessing the characteristic odour of the bark. The chief constituent is cinnamic

aldehyde, which by the bisulphite method should be equivalent to about 70 per cent. It also contains small quantities of eugenol and phellandrene. **Cinnamon Leaf Oil** (and other bodies) is used as an adulterant, but as it consists largely of eugenol it is easily detected by analytical methods. Other adulterants are cassia oil and artificial cinnamic aldehyde. Cinnamon oil is used medicinally and as a flavouring agent in dental preparations. In traces it enters the composition of certain Eastern perfumes.

Cinnamyl Butyrate is not much used, but with practice can be employed to give a fruity note to floral ottos such as rose and lily. Traces only are necessary in the latter. The propionic acid ester has similar properties, and its odour is described by E. J. Parry as grape-like.

Cinnamyl Cinnamate is a crystalline substance, when pure, melting at 44° C. It occurs in storax, has a sweet balsamic odour, and is useful in the heavy type of perfume. It is known also as **Styracin.**

Cistus—*see* Labdanum.

Citral is an unsaturated branched-chain aldehyde isomeric with **Neral.** It is widely distributed in nature, and among the oils containing it are lemon, lime, mandarin, verbena, lemongrass, and *Backhousia Citriodora.* Citral may be prepared synthetically, but commercially it is separated from the two last-named oils. It is very largely used in the manufacture of **Ionone,** and is of value for giving a fresh lemon odour to perfumes. Citral prepared from lemon or lime oils is, however, most esteemed for this purpose (*i.e.* high-class perfumery), and about 0·1 per cent added to the synthetic rose ottos will impart a most delightful freshness.

Citranol is a proprietary article stated to have a fragrant odour of honey (*see* Paramethyl Quinoline).

Citronellal does not find a place in high-class perfumery, but is used for perfuming cheap soaps on account of its

durability. It may be isolated from the oils of citronella and eucalyptus citriodora by means of sodium bisulphite.

Citronellal Hydrate—*see* Hydroxy-citronellal.

Citronella Oil. Three varieties are met with in commerce : Java and Singapore, from the *maha pangiri* grasses, and Ceylon, principally from *lana batu* grasses. Their use is confined to the preparation of cheap perfumes for soaps and as a source of **Citronellal** and second quality **Geraniol.** The main constituents are geraniol, citronellal, linalol borneol, methyl eugenol, limonene, dipentene, and camphene. The Java and Singapore oils have a finer odour, and are in consequence more esteemed, than the Ceylon oil, which is almost invariably adulterated.

Citronellol is a colourless liquid, isomeric, with rhodinol, and geraniol and occurring in rose and pelargonium oils. It has a sweet, rose-like odour and may be artificially prepared by reducing citronellal. It can be used for sweetening almost any type of perfume, but perhaps its greatest application is in the preparation of synthetic rose oils. The following formula will give good results :—

Citronellol	400 c.c.
Geraniol	400 „
Phenyl ethyl alcohol . . .	200 „
Nonyl aldehyde	10 „
Octyl alcohol	10 „
Citral (from lemon oil) . . .	1 „

Citronellol, either alone or mixed with geraniol, is known as **Roseol, Reuniol,** etc.

Citronellyl Acetate is a colourless mobile liquid with an odour resembling a mixture of lime and bergamot oils. It is used in special types of rose and carnation ottos, where it should not exceed 10 per cent, and also for sweetening almost any type of perfume. It occurs naturally in Ceylon citronella oil.

Citronellyl Butyrate is a colourless oil, and when used in small quantities with oakmoss resin will impart to a basic rose oil the odour of moss roses.

Citronellyl Formate has a bergamot-cucumber-rose odour. It is a colourless to pale yellow liquid, and is useful in special types of rose perfumes.

Citronellyl Propionate and Valerianate are now easily obtainable, and while their odours differ slightly from the other esters of citronellol, their use is practically on the same lines.

Civet, as imported in horns, is a yellowish-white fatty mass, which becomes darker and harder when exposed to the air. It has a most objectionable smell, but in weak solution is used as a fixative for many types of perfumes. It is a glandular secretion appearing in an outwardly discharging pocket underneath the posterior appendage of the civet cat, *Viverra civetta*, a native of Abyssinia and the Indian archipelago, the musk rat, *Viverra zibetha*, and other species. These animals are kept in captivity for the special purpose of extracting the civet from them, and while some is spontaneously ejected, it is stated that they are repeatedly titillated by the natives in order to increase the yield. The odour of civet is due to a ketone called zibetone which has been isolated by E. Sack.[1] Civet may be extracted as described in the chapter on Fixation, but it is frequently employed in the form of a strong tincture, when it is previously rubbed down in a mortar with an equal weight of powdered orris root and macerated with 80 per cent alcohol for one month. The menstruum is then poured off, and the marc re-macerated, the separated washings being mixed and concentrated at a low temperature *in vacuo*. Civet is liable to adulteration, and yellow paraffin jelly is much used for this purpose.

Civet Synthetic.—Many artificial substitutes are offered, and the best of these is tetrahydroparamethylquinoleine.

[1] Schimmel's "Report," Oct. (1915), 51.

Others are merely mixtures of indol, skatol, and phenyl acetic acid, but they will never entirely replace the natural product.

Clary Sage Oil—*see* Salvia Sclarea.

Clove Oil is obtained by distillation of the flower buds of *Eugenia caryophyllata*, N.O. Myrtaceæ, a tree grown in the Molucca Islands, Zanzibar, the West Indies, and Ceylon. The principal constituent is **Eugenol**, and this is largely used in the synthesis of **Vanillin**. The amboyna oil is considered the finest for œillet perfumes, although the other varieties are used in coloured carnation soaps. In addition to the phenol eugenol, acet-eugenol and caryophyllene are present in the oil.

Cochineal is the dried fecundated female insect, *Coccus Cacti*, reared on different species of nopalea in Mexico, the West Indies, and Canary Islands. The two most important varieties in commerce are silver grain and black grain. The former is more commonly met with and its silvery appearance is due to a waxy covering, the insects being killed without heat by means of sulphur fumes. The latter, which are dark brown to black, are killed by boiling water, the wax being removed in the process.

Liquid Cochineals are made by digesting the insects with an alkali (ammonia or potash being most commonly used), straining the solution, and making up to the required volume with a mixture of glycerin and water.

Cocoa-nut Oil is obtained either by expression or by decoction from the fruit of the cocoa-nut palm, *Cocos nucifera*. It has recently become very popular (after saponification) as an " emulsified " shampoo—*see* Toilet Preparations.

Coeur de Madelon. Honeysuckle compositions.

Concrete Orris—*see* Orris.

Concretes—*see* under Absolutes.

Convallaria is a proprietary lily base.

Copaiba Resin is the oleo-resinous exudation from the trunk of *Copaifera Lansdorfi* and other species of the N.O. Leguminosæ, trees found in the valley of the Amazon and other parts of South America. It has very little use in perfumery excepting as a fixative for extracts, where it requires judicious application.

Coriandrol is a name given to impure linalol.

Cortinarius Suaveolens is an aromatic fungus discovered by F. Bataille and L. Joachim[1] in the woods of Fontainebleau. It has a strong odour of orange blossom which remains until the fungus is quite dried up.

Corylopsis Spicata is a Japanese shrub, bearing pendulous racemes of yellow cowslip-scented flowers, that appear before the leaves in spring. Corylopsis perfumes are usually of the lily, ylang ylang type, to which small quantities of patchouli oil are added. The following formula will make a useful imitation :—

Benzyl propionate	250 c.c.
Cinnamic alcohol	70 „
Hydroxy-citronellal	50 „
Ylang ylang oil	60 „
Patchouli oil	50 „
Rose absolute	100 „
Benzoin tincture	410 „
Aldehyde C_{10}	10 „

Costus Root Oil occurs in the root of *Aplotaxis lappa*, N.O. Compositæ, a plant grown in North-Western India. It is a very scarce and expensive product, possesses an odour recalling orris, and owing to its tenacity is used as a fixative in violet bouquets. E. J. Parry[2] records the yield of oil as about 1 per cent.

Coumarin, as met with in commerce, is synthetically prepared (largely from salicylic aldehyde), and may be obtained as a powder or small or large crystals, melting at

[1] Schimmel & Co., "Report" (1919), 103.
[2] "Chemistry of Essential Oils," Part I. (1918), 284.

69° C. It occurs naturally in tonka beans and woodruff, but in the latter appears to result from the splitting up of a glucoside under the influence of an enzyme. It possesses an odour recalling new-mown hay, into which type of perfume it largely enters. This lactone is soluble in almost all liquids used in perfumery, and it blends well with vanillin and heliotropin. It is useful for imparting "body" to an odour, as the following example of *Fougère* will demonstrate :—

Coumarin	250 grams
Benzoin R.	150 c.c.
Terpinyl acetate	250 „
Musk xylol	50 grams
Linalyl acetate	150 c.c.
Geranyl acetate	100 „
Oakmoss resin	40 „
Vetivert oil	10 „

Coumarin from tonka beans may be obtained, but it is liable to adulteration with acetanilide. The methyl and ethyl esters of coumaric acid do not appear to have any extensive use (*see* Sylvanol).

Cratègine is a pseudonym for anisic aldehyde.

p-**Cresol Acetate**, also known as **Narceol**, is a liquid possessing a very penetrating odour, and was at one time considered to be indispensable for the accurate representation of the odour of the narcissus flower. It is useful in traces in honeysuckle perfumes (*see p*-Cresol Phenyl Acetate).

p-**Cresol Methyl Ether** is a colourless mobile liquid with a characteristic odour, which in extreme dilution recalls that of wallflower. It is prepared artificially, but occurs naturally in ylang ylang and wallflower oils. Its effective use in perfumery requires practice, as an excess will spoil any compound. Its principal use is in preparing synthetic wallflower and ylang ylang oils.

m-**Cresol Phenyl Acetate** has an odour recalling ylang ylang and is employed in the preparation of exotic perfumes.

In traces it is also useful for toning down the harshness of benzyl acetate, to which it imparts greater persistence.

p-**Cresol Phenyl Acetate** in the pure state is a crystalline body. It has an odour resembling narcissus, and as a base for this perfume is superior to the *acetate*. It does not possess the disagreeable odour suggestive of urine which is associated with the latter product even when in a high state of purity.

Cubeb Oil is obtained by distillation of the berry-like fruits of *Piper Cubeba*, N.O. Piperaceæ, a climbing shrub growing in the East Indies. It is colourless to pale green and possesses the characteristic odour of cubebs.

Cudbear is a purplish-red powder, prepared by evaporating an ammoniacal infusion of *Rocella tinctoria* and other lichens to dryness and afterwards reducing to powder. Tinctures prepared by maceration or percolation with alcohol produce a colouring matter which is not affected by acids.

Cuir de Russe. In Russia an oil (probably Birch Tar) is added to materials used in tanning leather with a view to covering their objectionable odour. The following formula will give some idea of the composition of the perfume known by this name :—

Rectified birch tar oil . . .	200 c.c.
Amber liquid	50 „
Petitgrain oil	300 „
Coumarin	150 grams
Musk Xylol	20 „
Alcohol C_9	30 c.c.
Rose synthetic	200 „
Methyl benzoate	50 „

Cumic Aldehyde (*Cuminol* or p-*iso-propyl-benzaldehyde*) occurs to the extent of about 30 per cent in cummin oil, and it has also been found in traces in the oil from cassie flowers. Its odour recalls orris, and it is useful in preparing

synthetic cassie, orris, and violet perfumes (*see* monograph on Cassie).

Cumin Oil is distilled from the fruit of *Cuminum Cyminum*, N.O. Umbelliferæ, a plant cultivated in North-eastern Africa. It is a limpid, pale yellow liquid with the characteristic odour of the fruit, and contains cymene and cumic aldehyde. Traces of it are useful in compounding synthetic cassie.

Cuminol—*see* Cumic Aldehyde.

Curcuma Oil. Oil of turmeric is obtained by distilling the rhizomes of *Curcuma longa*, N.O. Scitaminæ, a plant grown in the East Indies and Cochin China. It is stated to be used by the Egyptian perfumers in certain of their exceptional blends.

Cus Cus—*see* Vetivert Oil.

Cyclalia—*see* Hydroxy Citronellal.

Cyclamen is the name given to an exceptionally pretty genus of flowering plants which are found growing wild in the Alpine regions, but are much cultivated in greenhouses in this country. D. McDonald[1] says that careful hybridisation and selection has produced some beautiful forms that are especially attractive when in full bloom. He adds that *C. persicum* is one of the most powerfully scented. The odour of cyclamen recalls that of a bouquet composed of lilac and violets, with sometimes just a suspicion of hyacinth. The principal constituents of synthetic cyclamen will therefore be hydroxy-citronellal, ionone, linalol, terpineol, and either styrol acetate, cinnamic alcohol, or phenyl acetic aldehyde. The following formula will give a good imitation of the flower perfume :—

[1] "Fragrant Flowers and Leaves" (1895), 35.

Hydroxy-citronellal	200 c.c.
Linalol	250 „
Terpineol	250 „
Ionone alpha	25 „
Orris concrete	15 grams
Rose synthetic	50 c.c.
Cinnamic alcohol	80 „
Amber liquid	20 „
Aldehyde C_{10}	10 „
Benzoin R.	100 „

Cymene is a hydrocarbon found in oil of cumin (*which see*).

Cyperus is the name of a genus of several species, of the sedge family (Cyperaceæ), widely distributed throughout the tropical and sub-tropical regions of both hemispheres. Among the odorous species are *C. rotundus* and *C. scariosus*, both common in certain parts of India, where the dried and powdered roots are used as a perfume by the Indian ladies for their hair and clothes. An essential oil is extracted which is used for the same purpose (Sawer). *C. longus* is a British species, known as "English galingale." When broken, it is stated to have an odour resembling violets (*see* note under "Souchet").

Cypress Oil is obtained by distillation from the leaves and young twigs of *Cupressus sempervirens*, and *C. lusitanica*, N.O. Coniferae, trees native of Western Asia and growing in Europe. It is a yellowish viscous liquid with a characteristic aroma, which recalls that of the oleo-resinous exudation from the leaves and young stems of *Cistus Creticus* and *C. ladaniferus*. On evaporation it distinctly resembles ambergris.

The oil has been subjected to a detailed analysis by Schimmel & Co.[1] who identified the following constituents: Furfural, pinene, camphene, sylvestrene, cymene, a ketone, sabinol? an alcohol, esters of terpineol, and cedrol. It is used medicinally, but its value as a perfume fixator appears

[1] "Reports" (1904), 36; (1910), 46.

to have been overlooked. It is useful in artificial ambers of which an example follows :—

Musk extract soluble 10 per cent. .	400 c.c.
Civet „ „ „ „ „ .	300 „
Musk ketone	50 grams.
Coumarin	50 „
Tolu R.	70 c.c.
Benzoin R.	100 „
Cypress oil	30 „

Decyl Alcohol is a solid, melting at 15° C., and is one of the higher aliphatic alcohols which, together with other members of the series, have recently been introduced into perfumery. The odour of alcohol C_{10} may be said to be full and sweet, with the slightest suggestion of neroli-rose. Its use cannot be said to be confined to any particular type of perfume, although in both synthetic rose and neroli up to about 1 per cent gives excellent results, while for some types of rose as much as 5 per cent may be used. The addition of mere traces of this alcohol to many more or less commonplace perfumes will produce an odour of distinction.

Decylic Aldehyde is perhaps the best known of the higher aliphatic aldehydes. It is an oily liquid and is employed in traces for perfecting the synthetic floral ottos of cassie, jasmin, neroli, and rose. It occurs in certain essential oils, of which coriander, cassie, orange, and rose are good examples. The use of aldehyde C_{10} as a *base* in new perfumes has recently been advocated by a prominent French perfumer, but some experiment is required before any definite formulæ can be established. This aldehyde should be kept in 30 to 50 per cent solution with absolute alcohol, otherwise it will rapidly deteriorate, and rather than enhance, will spoil any perfume to which it is added. On oxidation it yields caprinic acid.

Dianthor and **Dianthin** are proprietary bodies recommended as fixatives for the carnation type of perfume. In

many respects they resemble benzyl iso-eugenol. Dianthor melts about 70° C.

Dimethylbenzyl Carbinol is a yellowish liquid having an odour recalling lilac in which compositions it may be used. Here is an example :—

Dimethyl benzyl carbinol	200 c.c.
Hydroxy-citronellal	200 „
Terpineol	400 „
Musk ketone	30 grams
Benzyl propionate	70 c.c.
Floranal	50 grams
Balsam of tolu	50 „

Dimethyl Hydroquinone is a crystalline solid, melting at 55° C. Its odour recalls that of melilot, and although it is not well known at present its remarkable fixative properties will earn for it a permanent place in perfumery. It will take the place of coumarin if carefully used, and blends well with musk. Ottos having a pleasant floral note can be made with it as follows :—

Dimethyl hydroquinone	200 grams
Vanillin	50 „
Amyl phenyl acetate	150 c.c.
Muguet synthetic	200 „
Jasmin extra	100 „
Tuberose absolute	100 „
Amber liquid	200 „

Diphenyl-methane is a crystalline substance, melting at 26° C., and may be prepared synthetically by the reduction of benzophenone with zinc dust. It has an odour which recalls both orange and geranium simultaneously. It is largely used in preparing synthetic pelargonium oil, and finds a place in many floral ottos. It blends well with coumarin, dimethyl hydroquinone, floranal, and hydroxy-citronellal.

Diphenyl Oxide is a crystallisable solid, melting at 28° C. and having an odour of geranium. It is cheap, and like diphenyl-methane is employed in preparing synthetic

geranium oils ; about 1 per cent is useful in foin coupé floral oils.

Douglas Fir Oil.—The leaves of the *Oregon Douglas Fir* are fragrant and possess an odour recalling pine-apples. With a view to determining the aromatic bodies producing this odour, C. T. Bennet[1] distilled an oil which on examination showed 31·5 per cent of alcohols calculated as geraniol. The presence of bornyl acetate somewhat masked the odour of this alcohol in the original oil, and in addition to these bodies he found traces of citral.

Duodecyl Alcohol is a liquid at normal temperature, but begins to solidify about 14° C. It possesses an odour recalling tuberose with a suggestion of violet, and is used in compounding these perfumes. Traces are also employed in narcissus compositions.

Duodecylic Aldehyde, also known as lauric aldehyde, is a solid at normal temperatures and melts about 24° C. In the pure state it possesses a rather objectionable fatty odour, but when much diluted this becomes comparatively pleasant and recalls violets. Aldehyde C_{12} is employed, in traces, for jasmin, muguet, and tuberose ottos and fancy bouquets, but its chief use is perhaps in violet oils, to which it imparts an unusual persistence. For this particular purpose about $\frac{1}{2}$ per cent will be found sufficient. It has been identified in pine needle oil.

Dyestuffs.—In the preparation of cosmetics a tint is frequently required which cannot be obtained by means of pigments ; nor is the use of insoluble colours always desirable. With a view to facilitating the choice of a suitable shade a list is given here of the more important dyes manufactured in Great Britain, and classified only in respect of their basic colour. Numerous tints can be obtained by experiment, and the adaptability of any particular dye will be found with practice :—

[1] "Proceedings Royal Irish Academy," Vol. 35, Section B, No. 5.

Blue.—*Alizarine Delphinol* possesses a clear blue colour and is fast to light.

Chlorazol Blues are numerous and of various shades.

Coomassie has a navy blue tint.

Di-sulphine Blue will produce a beautiful colour, brilliant, but not very stable in the presence of alkalis. By adding traces of *Auramine* glorious greens are obtained.

Indulines give a good colour; the hydrochlorides are soluble in spirit.

Lissamine Blue resembles di-sulphine blue in general properties.

Methylene Blues are obtainable in different shades. They make brilliant colours, but are rather sensitive to light.

Methylene Blue, 1814, is similar to the above, but has a deeper colour.

New Blue R. is dull.

Oil Blue resembles oil violet (*which see*) in general properties.

Paramine Sky Blue will give a brilliant shade.

Brown.—*Bismarck Brown* is useful for deep red tones and is fast to light.

Chlorazol in various shades.

Dark Brown Basic—any tint can be obtained from this by topping with yellows or reds.

Oil Brown resembles oil red in general properties.

Paramine Brown is yellowish.

Phenylene Brown is reddish.

Green.—*Alizarine Cyanine Green* is not very stable in the presence of alkalis—bluish tint.

Basic Green will give many beautiful shades with traces of tartrazine or methylene blue, 1814. It is not fast to light in the presence of alkalis.

Chlorazol Greens are obtainable in many shades.

Malachite Green has a distinct bluish tint and is very unstable.

Methylene Green is fast but dull.

Naphthol Green is brighter than methylene green and very fast to alkalis.

Oil Green is made, but will not give a *chlorophyll* shade. This can be obtained by mixing oil yellow base with a suitable blue.

Paramine Green is fast but dull.

Orange.—*Acid Phosphine R.* is yellowish-orange.

Acridine Orange has a pinkish shade.

Chlorazol is produced in various tints.

Chrysoidine N.S. for rich deep reddish-brown shades.

Paramine Fast Orange is yellowish.

Red.—*Acid Magenta N.* is purplish.

Acid Scarlet is a brilliant colour.

Aurine gives a clear red shade of great stability.

Azo acid, Cardinal B., for plum colours.

Benzopurpurine has a vermilion tint.

Bordeaux Brilliant B. is bluish.

Carmoisine is the exact synthetic imitation of genuine carmine.

Congo Corinth, *Congo Rubine* } two brilliant reds.

Chlorazol—different shades can be obtained in this make.

Crocine Scarlet is yellowish-scarlet.

Eosine group of dyes consists of the halogen derivatives of *fluorescein*, the shades ranging from yellowish-red to bluish-red—in the following order : *Eosin, Erythrosin, Phloxine, Phloxine P., Rose Bengal*, and *Rose Bengal 3 B.* They are not very fast.

Heliotrope 2 R. is bluish-red.

Magenta for purple shades.

Oil Red Base, *Oil Scarlet Base* } both are soluble in either vegetable or mineral oil.

Paramine Fast Red is brownish.

Ponceau is orange-red and very fast.

Rosophenine will produce pretty reddish-pink tints.
Safranine gives a brilliant clear pinkish-red.

Violets.—*Chlorazol Violet* is obtainable in numerous shades.

Coomassie Violet has a bluish tint, almost heliotrope.

Methyl Violets occur in shades varying from reddish to bluish—they are brilliant but unstable in alkaline solutions.

Oil Violet is soluble in vegetable and mineral oils, but if any difficulty is experienced it should be dissolved in oleic acid before being mixed.

Paramine Fast Violet has rather a dull tint.

Yellows.—*Acid Yellow* is pale and brownish.

Acridine Yellow is similar.

Auramine gives brilliant greenish tints and is fast.

Chlorazol Yellows are made in various shades.

Chrysophenine will give brilliant colours—golden tints.

Diazamine for orange effects.

Fast Yellow G. is browner than naphthol yellow.

Naphthol Yellow—a good fast dye of greenish hue.

New Phosphine for golden tints.

Oil Yellow Base will give a brilliant golden-yellow shade to either vegetable or mineral oils, and will readily dissolve.

Paramine Fast Yellow is fast to light in presence of alkalis—tint rather greenish.

Paraphenine G. is brilliant golden-yellow.

Primuline for lemon-yellow tones.

Tartrazine, one of the fastest dyes known—will give a clear colour and is suitable for any lemon-tinted liquid—acid or alkaline.

Eau de Sureau is elder flower water.

Eglantine.—This name has been used as a pseudonym for such products as iso-butyl phenacetate and iso-butyl benzoate.

Elder Flowers from *Sambucus nigra*, N.O. Caprifoliaceæ, yield on distillation an oil which is present in minute traces only. The water obtained by distilling the flowers is used in medicine and some toilet preparations. A synthetic elder flower oil may be made on the following lines :—

Coumarin	50 grams
Rose synthetic	250 c.c.
Geranyl butyrate	10 ,,
Geraniol from palmarosa	150 ,,
Terpineol	100 ,,
Methyl anthranilate	50 ,,
Benzyl acetate	50 ,,
Cassie synthetic	20 ,,
Musk ambrette	20 grams
Aubepine	300 c.c.

Elemi is a concrete (sometimes semi-liquid), resinous exudation from *Canarium luzonicum* or *Canarium commune*, N.O. Burseraceæ, a tree grown almost entirely in the Philippine Islands and known as "Manilla Elemi." When fresh it is fragrant, soft, white, and granular, but with age it becomes harder and yellow in colour. It yields about 10 per cent of an essential oil, with an odour recalling fennel. Elemi is useful as a fixative in a few perfumes, notably verbena and heather bouquets, but should not be used as imported. The following method of preparation will be found satisfactory : To 100 grams add an equal weight of alcohol ; macerate with frequent shaking for one week ; filter bright, discarding the residue on the filter paper.

Encens—*see* Olibanum.

Enfleurage is the process by which "Pomades" are made. A thin layer of lard or other fat is uniformly distributed on the surface of glass trays, which are then covered with fresh flowers. These are renewed periodically until the fat becomes fully charged with the flower perfume. It constitutes the so-called "pomade" from which the first,

[*Roure-Bertrand Fils.*

FIG. 1.—Manufacture of Pomades (Enfleurage).

[*Roure-Bertrand Fils.*

FIG. 2.—Distillation of Geranium.

[*To face page* 48.

second, and third infusions or "washings" are made. Both hot and cold processes are employed, as the one is frequently more suitable than the other for certain flowers. For full details see Part II., Chapter I. (*see* Fig. 1).

Eosine is tetra-brom-fluorescein, a dye used largely in making red ink and having a browny tint compared with erythrosine. Useful for tinting pink face powders.

Erythrosine is tetra-iodo-fluorescein, a brilliant red water-soluble dye, similar to eosine and phloxine, useful in preparing liquid rouges.

Essence de Portugal is sweet orange oil.

Estragon—*see* Tarragon Oil.

Ethyl Acetate is useful (in traces) in magnolia and ylang ylang perfumes and for fruity bouquets. It is largely employed in preparing fruit essences.

Ethyl Anisate is a crystalline body with a pleasant odour, and is useful in fancy bouquets.

Ethyl Anthranilate is an oil with a distinct orange-flower aroma and is used in synthetic neroli and jasmin oils. Its odour is more delicate than that of the methyl ester, and it does not become discoloured so rapidly when compounded in the above products.

Ethyl Benzoate is prepared synthetically and has a smoother odour than the methyl ester (Niobe oil). It is useful in synthetic ylang ylang.

Ethyl Butyrate is a liquid having a peculiar odour recalling that of rose. It is useful for modifying this type of perfume.

Ethyl Cinnamate occurs naturally in storax, but the commercial product is almost invariably prepared artificially. It has a sweet amber odour of great persistence. It is useful in oriental bouquets and in combination with clary sage and *citrus* oils will make delightful amber colognes.

Ethyl Decine Carbonate has been sold as "mignonette," and is useful up to 5 per cent in reseda floral ottos. It has a leafy smell and resembles methyl heptine carbonate, but is less pungent.

Ethyl Decylate is a colourless liquid having an odour of rose, into which compound it enters.

Ethyl Heptoate, or Œnanthylic ether, is sold as synthetic cognac. It is little used in perfumery, but has been recommended (in traces) as an addition to grain alcohol in the preparation of toilet waters.

Ethyl Laurinate is a yellowish liquid of pleasant odour and is useful in tuberose and fancy bouquets.

Ethyl Myristinate is at normal temperatures an oil having a powerful fragrance. It possesses marked fixative properties, and is used as a constituent of those artificial violet ottos which are intended for perfuming toilet powders.

Ethyl Nonylate is a liquid of rose odour which is occasionally used in compounding fancy bouquets.

Ethyl Octine Carbonate.—This product has been recently introduced into perfumery, but some experiment is yet required to establish definitely its most advantageous use.

Ethyl Phenyl-Acetate is a liquid with a sweet honey-like aroma, suggestive of musk, and is useful in certain types of artificial rose otto.

Ethyl Phthalate is a liquid with practically no odour. It has recently been introduced as a solvent for artificial musk, and is much used in the States as an addition to spirits intended for perfumery purposes.

Ethyl Salicylate is a colourless liquid having an odour similar to but finer than wintergreen oil and is useful in synthetic cassie.

Eucalyptol—*see* Cineol.

Eucalyptus Oil is distilled from the fresh leaves of *Eucalyptus globulus* and other species of the N.O. Myrtaceæ, trees growing in Australia and Tasmania and cultivated in Algeria, etc. It is much used medicinally and is also occasionally employed as a flavouring agent in dental preparations. The oil distilled from *E. citriodora* is lemon scented, while that from *E. stuartiana* is stated to recall the odour of ripe apples.

Eugenol occurs naturally in several essential oils, among which bay, cloves, and pimento are perhaps the most important. It possesses the characteristic odour of oil of cloves. Eugenol is the basis of many carnation perfumes and is successfully employed in oriental bouquets. Large quantities of eugenol are used in the commercial production of vanillin.

Eukarom is a novelty recommended by the makers for communicating a freshness to synthetic rose and acacia perfumes.

Farnesol is a sesquiterpene alcohol occurring in ambrette seed oil and cassie, rose and cananga flower oils. Its odour is faint, and has been described by E. J. Parry [1] as recalling that of cedar wood and lily of the valley. The peculiar honey-like fragrance of Bulgarian rose otto has been attributed to it. Farnesol is useful for blending sweet floral perfumes and oriental bouquets. It is really of very little value in synthetic rose.

Fennel Oil.—Two oils are met with in commerce—the sweet and the bitter—the former being of most interest to the perfumer. It is distilled from either *Fœniculum dulce* or *F. sativum*, N.O. Umbelliferæ, plants found on the shores of the Mediterranean and in other parts of Europe. The oil has a sweet, delicate aroma resembling aniseed, and like

[1] "Chemistry of Essential Oils," Vol. II. (1918), 112.

the latter oil contains anethol (about 60 per cent). It does not appear to be much used in perfumery.

Fixatives—*see* Chapter II, Part II.

Fixol is a name given to hydroxy-citronellal, of high boiling-point, about 275° C.

Floradora is the name given by M. Gattefossé to a base having remarkable fixative properties for the violet type of perfume. The following is his formula[1] :—

Tolu R.	150 grams
Labdanum R.	50 „
Benzoin R.	150 „
Ambre liquid	250 „
Coumarin	150 „
Vanillin	75 „
Musk ambrette	150 „
Violet natural lyflor	25 „
Benzyl iso-eugenol	150 „

Floranal is a proprietary fixing agent in white powder and useful in violet, jasmin, muguet, lilac, and tuberose ottos. It has a very sweet and persistent fragrance, and melts about 85° C.

Floranthin is a novelty useful in flower bouquets.

Foin Coupé, or new-mown hay perfumes, are mixtures of coumarin, lavender, or bergamot, with traces of oakmoss resin, clary sage oil, and synthetics added to round off the bouquet (*see* Miscellaneous Ottos, also Monograph on Hayfields).

Formidol is a proprietary crystalline fixative melting at 90° C. It is recommended for honeysuckle compounds.

Fougère perfumes are similar to foin coupé, but have a larger proportion of methyl- or iso-butyl salicylates in the compound.

[1] "Agenda du Chemiste Parfumeur" (1918), 106.

Fragarol—*see* β-Naphthol-butyl Ether.

Frangipanni—in English, Breadbreaking—is said to be the name of an ancient Roman family, who held the office of breaking the bread in the Holy Sacrament. A descendant of this family first invented a method of perfuming gloves, which became much in vogue at the time and the perfume in consequence very popular. Frangipanni was also the name given by French colonists in the West Indies to *Plumeria rubra* and *P. alba*, N.O. Apocynacæ, a shrub bearing delightfully fragrant flowers which have an odour recalling jasmin. Perfumes sold as frangipanni usually have the jasmin odour predominating, and the following formula, which can be varied to suit individual tastes, will be found useful :—

Jasmin synthetic extra . . .	400 c.c.
Neroli oil—Italian . . .	300 „
Rose, synthetic	200 „
Olibanum R.	20 „
Benzoin R.	40 „
Coumarin	25 grams
Musk ambrette . . .	10 „
Vetivert oil—English . . .	5 c.c.

Frankincense—*see* Olibanum.

Galbanum is a gum-resin obtained from *Ferula galbaniflua* and other species, N.O. Umbelliferæ, plants indigenous to Persia. It occurs in tears or masses of agglutinated tears, and yields about 10 per cent of volatile oil, which has a sharp, penetrating odour. A strong alcoholic extract, prepared as described under Benzoin, is useful in combination with ammoniacum R. as a basis for opoponax perfumes, especially since the oleo-resinous product from *Balsamodendron kataf* is unobtainable.

Gardenia, also known as Cape jessamine, is the flower of *Gardenia florida*, N.O. Rubiaceæ, a plant native to tropical Asia and South Africa. The perfume is seldom obtained from the flower, but is usually compounded on the lines of

the formula given under Frangipanni. If made up from basic materials, a large proportion should consist of benzyl, styrolyl, and linalyl acetates, together with methyl anthranilate, rhodinol, and terpineol, and traces of phenyl-methyl acetate (or benzyl-butyl-oxide).

Gardeniol appears to be phenyl-methyl-acetate which substance has an odour reminding of apricots.

Gaultheria Oil is distilled from the leaves of *Gaultheria procumbens*, N.O. Ericaceæ, a plant growing in Canada and the United States, and known there as "tea berry." The genuine oil is at present practically unobtainable, but an almost identical product, the oil distilled from the bark of *Betula lenta*, N.O. Betulaceæ, is offered commercially as wintergreen oil. Methyl salicylate is the principal constituent. The oil is used in medicine, and to some extent in perfumery as a component part of synthetic cassie and foin coupé.

Genêt or Broom is cultivated in Provence for the extraction of its perfume by means of volatile solvents. Genêt perfumes are frequently mixtures of synthetics only, in which methyl-*p*-cresol is an important constituent. Good fixatives are to be found in olibanum and musk (*see* Fig. 3).

Geranaldehyde—*see* Citral.

Geraniol is an alcohol found either as such or in combination in several volatile oils, notably those of palmarosa, and citronella, from which it is separated, and also in geranium and rose otto. The commercial article is a colourless liquid with a sweet, delicate rose odour. This differs slightly according to its source, the most esteemed being that obtained from palmarosa oil. It is extensively employed as the basis of all kinds of synthetic floral oils—rose being a notable example. The following formula will illustrate its use in this compound :—

[*Antoine Chiris.*

FIG. 3.—Cultures of Broom in Provence.

[*To face page* 54.

Geraniol	500 c.c.
Phenyl ethyl alcohol	200 „
Linalol	100 „
Rose de Mai, absolute	100 „
Citronellyl formate	25 „
Rosindol	25 grams
Ethyl phthalate	40 c.c.
Decylic aldehyde	10 „

Geranium Oils are obtained by distillation from the fresh herb of various species of *Pelargonium*, N.O. Geraniaceæ, grown in the south of France, Algiers, Corsica, Spain, Italy, and Bourbon. The resulting products differ materially in odour value, the oil obtained from the plants grown in the Vallauris district of France being usually considered the finest. Sometimes rose petals are added to the whole plant in the still, when the delightfully fragrant rose-geranium oil of commerce results—this oil is, however, very expensive. The principal constituents are geraniol and citronellol, together with small quantities of linalol, terpineol, and phenyl ethyl alcohol. Geranium oils are used for perfuming all kinds of toilet preparations, and they are invaluable in numerous floral bouquets. The terpeneless oils are twice the strength of the natural product, and are much used as the basis of artificial rose ottos. Algerian geranium oil has a slight musky odour (*see* Fig. 2).

Geranyl Acetate occurs naturally in many volatile oils, and may be obtained synthetically from geraniol and acetic anhydride. Commercial samples, however, are seldom absolutely pure, and E. J. Parry[1] states that they contain 95 per cent or more of the true ester. Geranyl acetate is a sweet, fragrant liquid, having an odour which recalls lavender. It is employed in certain types of synthetic rose otto.

Geranyl Butyrate may be prepared synthetically, and does not appear to have been found naturally in any essential oil. It has a characteristic heavy, rosaceous odour,

[1] "Chemistry of Essential Oils" (1918), 156.

and in small quantities is used in compounding artificial rose ottos of special type.

Geranyl Formate is a more valuable product than the butyrate, but has not yet been identified as a natural constituent in any volatile oil. It is synthetically obtained from geraniol and formic acid (anhydrous), and possesses a sweet fresh rose odour, which has been compared to that of guaiac wood. It enters the composition of many synthetic rose oils, where it should not exceed about 5 per cent, and is a necessary constituent of artificial neroli oil. Two and a half per cent added to terpeneless petitgrain oil will give a remarkably accurate representation of orange blossom oil.

Giant Hyssop Oil is obtained by distillation of the flowers of *Agastache pallidiflora*, N.O. Labiatæ, a plant growing abundantly on the Pacific Coast of North America. The flowers have an intensely fragrant odour; this recalls thyme before the buds expand, and a mixture of thyme and peppermint after blooming. The bruised leaves emit a similar odour. According to J. F. Couch[1] the flowers distilled in July and August yield from 0·155 to 0·163 per cent of oil—the best yield being obtained from fully expanded flowers. So far the oil does not appear to be a commercial article.

Ginger-Grass Oil is obtained by distillation from *Cymbopogon Martini*, N.O. Graminaceæ, the process being conducted by natives in India. In many respects it resembles palmarosa oil, and was at one time considered to be an oil of poorer quality, especially as it entered the market from Bombay, and in the same kind of container. Burkill, however, established the botanical source of this oil, and found that it was distilled from the sofia (= mediocre) variety of the so-called "rusa" grass. Ginger-grass oil has a pleasant aroma, and is used in cheap

[1] "Year Book of Pharmacy" (1922), 50.

perfumes. Geraniol is the chief constituent. An oil of a pale yellow colour, which does not darken on keeping and which closely resembles ginger-grass, has been obtained by Joseph and Whitfield[1] from *Cymbopogon nervatus*. This grass is known as "naal," and is widely distributed in the Sudan. The oil is obtained from the inflorescences, and consists principally of perilla alcohol and limonene.

Ginger Oil is distilled from the rhizome of *Zingiber officinale*, N.O. Zingiberaceæ, cultivated in Jamaica, Africa, India, and other countries. It is a pale yellow liquid of characteristic odour, but is not so pungent as the rhizome. The addition of this oil in traces to oriental perfumes will give a peculiar effect which is unobtainable with any other material, the result obtained being extremely difficult to imitate.

Giroflée is the wallflower (*which see*).

Glyceryl Acetate, or Acetin, is made by heating together glycerin and glacial acetic acid. It is used as a solvent and has been employed as an adulterant of citrus and other essential oils.

Glycine is the popular name for *Wistaria sinensis*, a climbing plant, native of China, and commonly grown in gardens in this country. The mauve and white flowers bloom in early summer and take the form of pretty drooping racemes, and the perfume they exhale is faint, but somewhat honey-like. In extreme dilution methyl-para-tolyl ketone resembles this odour. Glycine is also the name given to fancy bouquets made from violet, lilac, and jasmin ottos.

Guaiacum Wood Oil, also known as champaca wood oil, is distilled from *Bulnesia Sarmienti*, N.O. Zygophyllaceæ, a tree growing in Southern America. It is solid at ordinary temperatures and melts about 45° C. It has a delicate odour recalling tea-roses, and is used for blending with

[1] "Year Book of Pharmacy" (1922), 67.

other oils in perfumery. Guaiac oil has been found as an adulterant of otto of roses.

Hæmatoxylin—*see under* Logwood.

Hamamelis.—The only preparation of this plant used in cosmetics is obtained by distilling the leaves of *Hamamelis virginiana*, N.O. Hamamelidaceæ, and known in pharmacy as Liquor Hamamelidis Dest. It is a colourless liquid of characteristic odour, containing about 17 per cent of alcohol added as a preservative. It is used up to 50 per cent in stearic acid creams of the witch hazel snow type (*which see*), and as an astringent in skin lotions of all kinds.

Hawthorn, or May blossom (*Crataegus oxycantha*), is a well-known hedge tree belonging to the N.O. Rosaceæ, and is a native of most parts of Northern Europe and Asia. The myrtle-like blossoms have an exquisite fragrance, which is recalled by anisic aldehyde. This is the base of all perfumes of this type and the odour is rounded off with acetophenone and rose. For further details and formulæ, see the monograph on the subject.

Hayfields.—*Foin coupé* perfumes do not appear to be popular at the moment, but a note on them will be useful here. The base of most perfumes of this type is coumarin in combination with the terpeneless oils of bergamot and lavender, the odour being rounded off with methyl salicylate, clary sage oil, and oakmoss resin. The two plants which contribute largely to the odour of the hayfields are *Alyssum compactum* (sweet alyssum) and *Anthoxanthum odoratum* (sweet-scented vernal grass). The sweet woodruff is also delightfully fragrant. For further details, see monograph on New-mown Hay.

Heliotropin-Amorphous is piperonal-vanillone.

Heliotropin (Piperonal) is a white or yellowish-white crystalline body having the delightful odour of cherry pie. It is artificially prepared by the oxidation of **iso-safrol**, but was originally obtained from pepper by a special process.

Heliotropin melts at 37° C., is a useful fixative, is indispensable as a base for heliotrope perfumes, and is one of the most popular modifiers in use. It is of distinct value in carnation and sweet-pea perfumes, while it blends well with anisic aldehyde, vanillin, musks, coumarin, benzyl isoeugenol, and several essential oils, including bergamot, neroli, and rose. The only disadvantage it possesses is that of turning reddish-brown on exposure to light for any period. This is a point which must not be lost sight of, as the employment of piperonal for perfuming white creams or lotions might be followed by disastrous results. If the heliotrope odour is desired for such preparations, however, it can be imitated to some extent by vanillin and traces of benzaldehyde. Heliotropin should be kept in a cool dark place, otherwise the odour value will deteriorate appreciably (see monograph on **Heliotrope** for further details).

Hemerocallis Flava, also known as day lily or yellow tuberose, is a beautiful flowering bulbous plant whose yellow lily-like blossoms seldom last longer than one day. Fortunately there is a plentiful succession, so that the plant continues to exhale its pleasant perfume for a considerable time. Hemerocalle ottos are artificially prepared by mixing together in suitable proportions, linalol, cinnamic alcohol, amyl salicylate, rhodinol, and hydroxy-citronellal, with traces of salvia sclarea.

Henna powder of commerce consists of the ground leaves of *Lawsonia inermis*, N.O. Lythraceæ, a thorny tree or shrub grown in Northern Africa and India. It was much used by the Egyptians and Asiatics for dyeing the hair, finger-nails, etc., of an orange hue. It has recently come very much into vogue in shampoos, brilliantines, etc., and is extensively used for dyeing the hair a rich auburn tint.

Heptyl Alcohol, or methyl-amyl-carbinol, has been identified as a constituent of clove oil. It is prepared artificially and may be used in carnation ottos.

Heptyl Aldehyde is an oily liquid having a heavy fruity odour of great persistence, and although it is not much used in perfumery, mere traces of it will completely alter any compound to which it is added—0·1 per cent should seldom be exceeded. It is commonly called **Œnanthic Aldehyde**, and, according to E. J. Parry,[1] is formed when castor oil is distilled under reduced pressure.

Heptyl Heptoate is an oily liquid having similar properties and uses to aldehyde C_7. It combines well with coumarin compounds.

Hexadecyl Aldehyde (C_{16}) possesses a powerful odour recalling strawberries, and is used to give a new note to many of the commoner floral bouquets. It is stated to be a mixture which owes its strawberry note to an ester.

Hexyl Acetate.

Hexyl Alcohol, normal and iso-.

Hexyl Butyrate.

Hexylene Alcohol.

Hexylic Aldehyde.

Hexylmethylketone is a pungent liquid whose odour recalls mignonette and also œillet. For obtaining a new note in either of these perfumes it is invaluable. An illustration of Carnation will suffice to show this.

Iso-eugenol	400 c.c.
Hexylmethylketone	100 „
Cananga oil, terpeneless	75 „
Nerol	50 „
Coumarin	70 grams
Œillet absolute	100 „
Benzyl iso-eugenol	100 „
Benzoin R.	80 „
Musk ambrette	20 „
Clary sage oil	5 c.c.

[1] "Chemistry of Essential Oils," Vol. II., 168.

These bodies have a fruity odour and have been identified in nature. They are now prepared artificially, but do not appear to have any use in perfumery other than in the modification of floral odours.

Homo-Linalyl Acetate is prepared synthetically, and its odour resembles that of bergamot oil, to which has been added some lavender. It differs slightly from linalyl acetate, but in a general way is not so useful.

Homovanillin is a white crystalline substance melting at 50° C., and having an agreeable floral odour which resembles vanilla more closely than vanillin.

Honeysuckle, or Woodbine (*Lonicera Periclymenum*), is a twining shrub of the N.O. Caprifoliaceæ, attaining a considerable height on trees, and is a favourite for forming arbours and planting against houses. The flowers possess a delicious fragrance. Honeysuckle perfumes are seldom obtained from the flower, but are generally mixtures of rhodinol, benzyl acetate, linalol, methyl anthranilate, and vanillin, with traces of para-cresyl acetate.

Hops. An oil is obtained by distillation of the female inflorescences and the lupulin of *Humulus Lupulus*, N.O. Urticaceæ. It has a greenish-yellow colour and possesses the characteristic odour of the hop. It is used in the brewing and mineral water industry.

Hyacinthin is a name given to phenyl acetic aldehyde.

Hyacinth Oil has been isolated from the flowers of *Hyacinthus orientalis*, N.O. Liliaceæ, but the perfume is usually extracted in the form of pomade or concrete. The greater number of hyacinth oils on the market are prepared synthetically, with one or other of the following bodies as their base :—

Bromstyrol has a strong, crude hyacinth odour, and is used generally as a soap perfume.

Cinnamic Alcohol possesses a much milder and sweeter odour, and has distinct fixative qualities.

Phenyl Acetic Aldehyde is the most suitable article for fine perfumery, and its odour is smooth, sweet, and powerful.

Styrolene Acetate possesses a sweet and delicate hyacinth-like perfume, and is frequently used to blend with other oils where a suggestion only of the flower is required (as in Cyclamen, *which see*).

The following formula is appended in order to give some idea of the composition of commercial hyacinth oils :—

Phenyl acetic aldehyde . . .	300 c.c.
Phenyl ethyl alcohol . . .	100 „
Coumarin	50 grams
Cinnamic alcohol	100 c.c.
Terpineol	300 „
Iso-butyl phenacetate . . .	50 „
Benzyl acetate	20 „
Benzoin R.	80 „

For further details and formulæ, reference should be made to the monograph on Hyacinth.

Hydro-cinnamic Acid is a crystalline substance melting about 46° C., and may be synthetically prepared by the reduction of cinnamic acid with sodium amalgam. It possesses a pleasant hyacinth-rose odour, and is useful for fixing this type of perfume.

Hydroxy-citronellal is a colourless or pale yellow, viscous oil with a sweet, powerful odour recalling tilleul (lime or linden blossoms). To perfumers the synthesis of this body is probably the most remarkable discovery of recent years. It has made it possible to accurately reproduce the odour of muguet, and by the addition of traces to other floral ottos has assisted in imitating faithfully perfumes which had previously been comparatively crude. Furthermore, owing to its high boiling-point, it is a fixative of no mean order, and probably tops the list of synthetics of this class. The hydroxy-aldehydes are prepared by hydrating the corresponding unsaturated aldehydes—generally by treating the bisulphite compound with fairly con-

centrated sulphuric acid. There is a great variation in the odour value of commercial samples, and many resemble citronellal much more than its hydrate. "La Parfumerie Moderne," in referring to this body as a fixative, states that the portion considered to be most odorous boils at 200° C., *in vacuo*, at 1 mm.; while the two portions which are kept in **Fixol** boil at 275° C. and are practically non-evaporable.

As an illustration of the value of hydroxy-citronellal *as a base* a formula for lily of the valley otto is appended :—

Hydroxy-citronellal	500 c.c.
Geraniol from palmarosa	100 „
Ylang ylang oil-manilla	100 „
Linalol	100 „
Terpineol	100 „
Benzyl acetate	30 „
Rose synthetic	20 „
Civet extract soluble 10 per cent	50 „

The following formula for lilac otto will show how it can be used *as a blender and fixer :—*

Terpineol	650 c.c.
Phenyl ethyl alcohol	100 „
Vanillin	50 grams
Musk ambrette	20 „
Methyl anthranilate	30 c.c. (melted)
Hydroxy-citronellal	150 „

Hydroxy-citronellal is known under several names, such as muguettine principe, cyclalia, cyclosia, lily aldehyde, muguet synthetic, etc.

Hypnone (*see* Acetophenone).

Hyracéum is a secretion having a most disagreeable odour of excreta and urine, and is obtained from a species of monkey. It is occasionally used as a substitute for **Castor** (*which see*). This material is not recommended.

Incense (*see* Olibanum).

Indol is a white crystalline body which melts at 52° C., and on exposure to light and air soon assumes a reddish tint.

It possesses a powerful and decidedly disagreeable odour, but in extreme dilution this acquires a distinct floral note. Indol occurs naturally in the oils of jasmin and neroli and in the animal organism as a product of intestinal digestion. E. O. von Lippmann[1] has shown that it occurs, together with skatol, in the vapours given off when extracting sugar from molasses by the strontia method. It is synthetically prepared during the manufacture of indigo, and is used in the preparation of artificial jasmin and neroli oils.

According to Hesse and Muller, natural jasmin oil contains $2\frac{1}{2}$ per cent of indol, but in compounding synthetic jasmin 1 per cent is sufficient, providing the otto contains about 10 per cent of jasmin natural concrete. Two per cent may be used in cheaper floral ottos, but the perfume becomes objectionable after slight evaporation. In order to overcome this difficulty, phenyl acetic acid has been recommended in place of indol, but the resulting oil is not so true to the odour of the flower. Indol when mixed with other synthetics and exposed to light rapidly becomes reddish-brown in colour, and should not be used for perfuming white toilet articles on this account.

Ionone is one of the most useful synthetics employed by perfumers, and is the indispensable base for all violet bouquets. According to patent specifications it may be prepared by the condensation of **Citral** with **Acetone** in the presence of alkalis, the resulting body yielding a mixture of two isomeric ketones known as Alpha Ionone and Beta Ionone. The cheapest article met with in commerce is usually a mixture of the two ketones to which has been added a proportion of cedar-wood oil. This body is not much used in fine perfumery, but is sold in large quantities as a soap perfume, 10 to 15 grams being sufficient for 100 kilos of soap.

All three commercial ionones, alpha, beta, and 100 per cent (a mixture of the two ketones without alcohol), are

[1] Schimmel & Co., "Report" (1916), 135.

manufactured by numerous firms under different trade names, such as "**Violetton**," "**Rhodione**," etc., the products differing slightly in aroma. When freshly prepared and of 100 per cent purity, alpha and beta ionones are colourless, the former possessing a slight odour of cedar-wood. The average sample met with in commerce, however, is of greenish-yellow colour, and the odour is not so delicate, probably owing to traces of citral, acetone, and terpenes. The odour of diluted ionone recalls orris, and when further mixed with alcohol has a marked resemblance to fresh violets. At one time this product was only obtainable in 10 per cent solution, and it is a curious fact that when first added to spirit the odour entirely disappears, but it develops again in the course of a few days. One of its peculiar properties is that of benumbing the olfactory nerves, and this has occasionally led inexperienced workers to believe that the article has no odour value whatever. As a perfume, it has been described as "thin," and the art in its use lies in being able to so back it up in a compound that the resulting violet bouquet has "body." The purer the ionone the more difficult becomes this operation, but the following articles will be found useful for the purpose: **Concrete Oil of Orris, Ylang Ylang, Santalwood, Bergamot and Clary Sage Oils, Synthetic Cassie, and Floranal.** To obtain a leafy effect **Methyl Heptine Carbonate** is indispensable. For fine perfumery in general alpha ionone is the most useful, but for certain types, such as violette de parme, beta ionone with jasmin is preferable. In no violet otto should the ketone exceed 60 per cent of the total, the remainder consisting of blenders, modifiers, and fixers, as the following example will show:—

Ionone, 100 per cent alpha ketone	550 c.c.	
Methyl heptine carbonate . .	10 „	
Concrete orris oil	40 grams	
Santalwood oil	100 c.c.	
Cassie synthetic	100 „	
Violet leaves concrete . . .	50 grams	
Ethyl myristinate	10 c.c.	
Guaiac wood oil	140 „	(melted)

One ounce of this otto is sufficient for perfuming one hundredweight of toilet powder.

Iraldeine—*see* Methyl-Ionone.

Irenia is a new synthetic introduced by a French chemist. It has a characteristic violet odour and is a very fine fixative. Both the alpha and beta varieties boil at 180° C. (under 12 mm.).

Iris—*see* Orris.

Irisine is the name given to a proprietary violet base.

Irisol is a name given to irone synthetically prepared, to liquid orris oil, and to a mixture (solid) of acetanilid and orris oil.

Irone is isomeric with ionone and is the odorous ketone present in concrete orris oil. It is a colourless liquid, having an aroma slightly different from ionone, but quite characteristic of orris root. Being expensive, it has not such an extensive application as its isomer, but no synthetic cassie is complete without it.

Iso-Butyl Acetate is a colourless liquid with an odour recalling a mixture of raspberry and pear. It has been recommended in traces for modifying artificial rose ottos.

Iso-Butyl Benzoate is an oil having a pleasant smell, and has been described as "Eglantine 100 per cent." It is a valuable asset in the preparation of sweet-pea and trefle perfumes, and is a useful fixative.

Iso-Butyl Cinnamate is an oil recommended as a useful constituent of oriental bouquets.

Iso-Butyl Phenacetate is a colourless liquid with a sweet, penetrating, musk-like odour, and like the benzoate has been named "Eglantine." It will give a beautiful, fresh note to almost any floral perfume, and in particular to carnation and rose ottos. For this purpose about 5 per cent is sufficient, but as a basis for fancy odours up to

20 per cent may be used. The following formula will give some idea of its possibilities :—

Iso-butyl phenacetate	200 c.c.
Hydroxy-citronellal	150 „
Styrolene acetate	80 „
Linalol	150 „
Diphenyl oxide	20 grams
Amber liquid	250 c.c.
Coumarin	100 grams
Floranal	50 „

Iso-Butyl Salicylate is a colourless fragrant liquid with an odour resembling amyl salicylate. It is useful in trefle, orchidée, etc., and possesses distinct advantages over methyl salicylate for compounding synthetic cassie.

Iso-Eugenol occurs naturally in oils of ylang ylang, and champaca flowers, but may be prepared artificially by treating eugenol with (amyl) alcoholic potash. It is a light yellow, viscous liquid, having an odour recalling clove pink, and is of considerable importance in the manufacture of **Vanillin.** Iso-eugenol is most useful as a base for carnation perfumes, and in combination with musk and civet is employed largely in producing oriental ottos. The following formula will illustrate its application in the compounding of synthetic œillet :—

Iso-eugenol	500 c.c.
Terpineol	200 „
Coumarin	50 grams
Iso-butyl phenacetate	40 c.c.
Clary sage oil	10 „
Neroli oil	100 „
Benzyl iso-eugenol	100 grams

Iso-Propyl Alcohol is now a commercial article, and has recently received much attention as a substitute for ethyl alcohol in the preparation of toilet waters. According to Grant and Johns,[1] it is produced solely as a by-product of the petroleum and natural gas industry in the

[1] "American Journal of Pharmacy," June, 1922.

United States, and is made by absorbing olefine gases, containing propylene, in sulphuric acid and hydrolysing the resulting alkyl sulphuric acids. The crude alcohol is separated by distillation and purified by chemical treatment and rectification. The anhydrous alcohol boils at 82·4° C. and has a specific gravity of 0·789 at 15·6° C. It is a colourless liquid, with a characteristic alcoholic odour, and is miscible in all proportions with water, but may be salted out by saturating the solution with sodium chloride. The odour of iso-propyl alcohol is difficult to cover, especially if it is employed in the preparation of eau-de-Cologne. For this purpose beta naphthol ethyl ether is useful, and the bouquet may then be built up with terpeneless *citrus* oils. The alcohol may be diluted with water to 30 per cent strength and a cheap product will then result, but in odour value it cannot be said to compare favourably with those Colognes made with 90 per cent ethyl alcohol which are distilled. As a solvent for essential oils, 40 per cent iso-propyl alcohol is about equal to 80 per cent ethyl alcohol. As a gum-resin solvent this alcohol is useful and may be successfully employed in preparing such resin-odors as olibanum, galbanum, and ginger, but for delicate odorous bodies such as benzoin and cistus it is not recommended.

Iso-Safrol is a colourless, fragrant liquid isomeric with safrol and obtained from it by treatment with alcoholic potash. It is used in the manufacture of heliotropin, in soap perfumery, and in traces for modifying bouquets of the "eastern" type.

Ivanol is a proprietary fixative stated to be obtained by distilling (?) a mixture of balsams.

Iva Oil is distilled from *Achillea moschata*, N.O. Compositæ. It is a liquid of blue-green colour which turns to olive-green in the course of time.

Jaborandi Leaves are obtained from *Pilocarpus Jaborandi* and other species of the N.O. Rutaceæ, a plant grown

in South America. A tincture 1 in 5 and a liquid extract 1 in 1 are made with 45 per cent alcohol, and both are useful in hair preparations. The alkaloid **Pilocarpine** is obtained from jaborandi and is used medicinally. Jaborandi leaves contain about 0·5 per cent of essential oil, having an odour resembling rue.

Jacinthe—*see* Hyacinth.

Japan Flowers. Bouquets of this name were at one time popular. Gattefossé [1] gives the following formula, which on maturing makes a suitable perfume for toilet preparations :—

Vanillin	80 grams
Musk, artificial	100 „
Geranium de France, terpeneless	250 „
Patchouli oil	60 „
Jasmin	150 „
Heliotropin	150 „
Iso-Eugenol	30 „
Cananga oil	200 „
Rose, synthetic	80 „
Mousse de chêne	10 „
Benzoin resinodor	60 „
Fleur d'oranger absolute	30 „

Jaracanda is a name for Bois de Rose.

Jasmin—The jasmin perfume of commerce is obtained by means of volatile solvents or enfleurage from the flowers of *Jasminium grandiflorum* and allied species, N.O. Oleaceæ. The oil extracted from this product has been analysed by Hesse and Muller, with the result that synthetic jasmin ottos are now in common use. For details and formulæ see the monograph.

Jasmone is the name given to a ketone found in jasmin oil. Several synthetic jasmones have been offered, but they do not appear to be much in vogue, as the average

[1] "Agenda du chemiste Parfumeur" (1918), 128.

perfumer prefers to use natural jasmin concrete or liquid for giving the necessary finish to his jasmin creations.

Jatamansi is a name given in India to the true spikenard (*which see*), and is a synonym also for sumbul root.

Java—Fancy bouquets of this name appear to have verbena oil as their base.

Jockey Club—Perfumes bearing this name are legion, and it is strange to say that nearly all of them differ materially in odour value. A very pleasant bouquet which will answer to this description may be made by mixing in suitable proportions jasmin, rose, neroli, and violet with traces of patchouli oil. Terpeneless bergamot oil has also been recommended as a base for this perfume. Gattefossé in his "Formulaire de Cosmetique" gives the following formula for Jockey Club :—

Iris	500 grams
Cassie	100 „
Orange	100 „
Jasmin	100 „
Bergamot	50 „
Rose d'Orient	75 „
Amber essence	75 „

Jonarol is a name given to artificial violet bases, possibly ionone or methyl-ionone.

Jonquille belongs to the narcissus family and is sometimes called rush daffodil. The base of most jonquille perfumes is **Phenylethyl-Phenacetate**, the odour of which recalls that of the flower. If suitably backed up with jasmin, rose, styrolene acetate, and traces of basil and patchouli oils, a good imitation of the flower perfume results. For formulæ and further details see the monograph.

Kananga Oil—*see* Cananga and Ylang Ylang.

Kaolin is a fine variety of white or greyish-white porcelain clay resulting from the decomposition of felspar.

It consists principally of aluminium silicate, and is also known as china clay and orthoclase. A superior quality of this material, called **Osmose Kaolin**, has recently been introduced and is electrolytically purified. It is a clean, smooth, white *colloidal* powder, and the particles are no larger than bacteria. This product has found employment in medicine for the treatment of dysentry, summer diarrhœa, colitis, and similar bacterial infections. It is also superior to the ordinary commercial article as a filtering medium. It is of particular interest to perfumers as it is especially well adapted for use in face powders, being peculiarly adherent. It is also a good substitute for precipitated chalk in the manufacture of tooth pastes.

Kapur-Kachri.—The product bearing this name in the Hindu, Bengalee, and Bombay dialects, and valued as a perfume in the east, especially by the Arabs and Persians, and used by the Hindus as incense in worship, consists of the dried root of *Hedychium spicatum*. For further details, see Sawers' "Odorographia," second series.

Katchung Oil, also known as arachis and pea-nut oil, is obtained from the seeds of *Arachis hypogœa*, N.O. Leguminosæ, a plant growing in India, etc. It is a cheap substitute for expressed oil of almonds.

Khus-Khus Oil is oil of vetivert (*which see*).

Kieselguhr is mainly silicon dioxide, and consists of the remains of extinct diatoms. It is met with in commerce as a white or greyish-white powder and is used as a base for coloured dental creams and powders. Owing to its being adherent and light it is useful in face powders up to 10 per cent.

Labdanol is the name given to the odorous principle of labdanum resin extracted by Verley.

Labdanum is an oleo-resinous secretion from the leaves of several species of *Cistus*, a genus of the rock rose family (*Cistinæ*), particularly *C. creticus* and *C. ladaniferus*.

These plants are widely distributed over the rocky ground of Macedonia, Thrace, Greece, Southern France, Spain, Portugal, and the islands of Crete and Cyprus, where they are very abundant. In spring, and especially in summer, the very numerous glandular hairs of the leaves and young stems exude a large quantity of a sticky, balsamic, resinous substance with an odour varying very much according to the species in question and giving a very characteristic odour to the thickets in which the cistus grows. According to A. Camus[1] the oleo-resinous substance is yielded most freely from May to July and towards noon, but the extremity of the branches is always highly glutinous, and the exudation is often fairly abundant as early as March. In Cyprus, labdanum is collected by the shepherds by combing it from the fleeces of the sheep, which become loaded while they are pasturing. In Crete, however, a special instrument called a *ladanisterion* is employed. It is a kind of double rake with leathern thongs instead of teeth and is used in the manner of a whip. The straps become quite cylindrical and rope-like when fully charged by the adhering resin, and this is ultimately scraped off with a knife. It is subsequently purified, as much as 60 per cent of sand being sometimes removed in the process. The resin may also be obtained by boiling the branches in water. Labdanum was formerly placed on the market in cakes, small balls, twists, cords, rods, and in bladders, where the resin continued to assume consistence. The crude material is now imported in dark brownish or greenish lumps, which almost invariably contain hairs and pieces of broken leaf. From this debris it is possible to determine the species of cistus from which the commercial labdanum was extracted. Labdanum has at all times been employed either in medicine or perfumery, and to-day is one of the common constituents of fumigating pastilles. This gum is of great interest to the perfumer, but does not appear to have the extensive employment it deserves, probably owing to its

[1] Roure-Bertrand Fils, "Bulletin," 1920 (October), 4.

variable quality and liability to adulteration. The purification of the commercial article is easy and can be accomplished by maceration with strong alcohol, the extraneous matter being removed by filtration and the resulting clear liquid concentrated at a low temperature *in vacuo*. The colour of the purified gum-resin may be either yellowish-brown or green, and the odour of some specimens is faintly ammoniacal. This may be due to the contamination of the oleo-resin with nitrogenous matter while still adhering to the fleece of the sheep. A good sample has a powerful but sweet characteristic odour, recalling ambergris, and possesses wonderful fixative properties. It is particularly useful in artificial ambres, where up to 5 per cent is generally sufficient; traces also are valuable in verbena and violet perfumes. Between 1 and 2 per cent of volatile oil has been obtained from the oleo-resin.

Lanolin, also known as *Adeps lanæ*, or wool fat, is the purified cholesterin—fat of the wool of the sheep, *Ovis aries*. It is a yellowish, tenacious, unctuous substance, almost inodorous in the best qualities, with a melting-point varying from 40° to 44° C. It is used in pharmacy as a basis for ointments. For toilet preparations it is valued on account of its ready absorption by the skin and the absence of a tendency to rancidity. It is commonly known as *anhydrous* lanoline. Hydrous wool fat consists of 70 parts of *Adeps lanæ* with 30 parts of water, and is generally known as lanoline.

Lard, or adeps, is the purified fat of the hog—*Sus scrofa*. It is a firm white substance fusing about 38° C. and consisting of olein (about 50 per cent), palmitin, stearin, laurin, myristin, and a little linolin. It is used as an ointment base in pharmacy and for skin creams and hair pomades in cosmetics. It is the basis of most of the fats used in enfleurage (*which see*). In order to prevent rancidity, it may be digested at 60° C. for one hour with 3 to 5 per cent. of gum benzoin.

Lathyrus Odorata—*see* Sweet Pea.

Lavender Oil is obtained by distillation from the flowers of *Lavandula vera*, N.O. Labiatæ, a plant native of the lower Alps bordering on the Mediterranean. The two varieties of most interest to the perfumer are undoubtedly those produced in England and the finest quality imported from France and sometimes known as "Mont Blanc" oil. Of the English oils the one most esteemed is probably "Mitcham," although in reality the plant is frequently grown on the neighbouring Surrey hills. Oils of very fine bouquet are also distilled in Cambridgeshire, Hertfordshire, and Suffolk, but owing to the present high price of all English lavenders, they are not in brisk demand. The finest French oil is very largely used and is cheaper, but its bouquet is not to be compared with English lavender. The main difference otherwise between the two products is that the latter contains 7 to 10 per cent of esters (calculated as linalyl acetate), whereas the former indicates as much as 44 per cent or over. The odour of English lavender oil improves immensely when matured for some years, especially if 1 per cent of absolute alcohol is added before storing—the conditions essential being a dark and cool atmosphere. The uses of this oil are so widely known that no reference is necessary here excepting perhaps that the best lavender waters are obtained by suitably blending both the English and French oils. Traces of sal volatile are said to improve the product.

Spike-lavender Oil, or aspic oil, distilled from *Lavandula spica*, N.O. Labiatæ, is imported from France and Spain and is employed as a soap perfume and sometimes as an adulterant of lavender oil. Commercial samples are frequently mixtures of turpentine and lavender.

Lavandin Oil is the name given in the South of France to the product obtained from a cross between lavender and spike.

FIG. 4.—Reaping English Lavender on the farm of Messrs. Stafford, Allen & Sons, Ltd., at Long Melford in Suffolk. [*To face page* 74.

Lavendol is stated to be impure linalol.

Lawsonia Inermis—*see* Henna.

Lemonal is a pseudonym for linalyl acetate.

Lemon-grass Oil is distilled from the grass *Cymbopogon citratus* and *C. flexuosus*, N.O. Graminaceæ, cultivated in the East and West Indies, the former variety being most frequently met with in commerce. The oil is of a pale sherry colour with a peculiar fragrant, lemon-like odour resembling the true verbena, but not so fine. It contains about 80 per cent of citral, together with citronellal, geraniol, and methyl-heptenone. This oil is used in the preparation of citral for the manufacture of ionone and is generally sold on its citral content.

Lemon Oil is a pleasant-smelling, bright yellow liquid obtained by expressing the peel of the nearly-ripe fruit of *Citrus limonum*, N.O. Rutaceæ. According to E. J. Parry,[1] the tree is a native of India and was introduced into Southern Europe, probably first into Spain and thence to the south of France and Italy. The principal centre of the industry to-day is Sicily and the Calabrian Belt, the oil being obtained between the months of November and March or April. The three principal processes are :—

(*a*) The *sponge* process.

(*b*) The *ecuelle* process.

(*c*) *Machine* processes, including the employment of centrifugal separators.

(For a brief description of these three methods reference should be made to Chap. I., Part II.)

Distillation is sometimes applied to partially extracted peels, but the oil obtained is of inferior quality and is generally added to better products.

The principal constituent of lemon oil is the aldehyde **citral**, which is present to the extent of 4 to 6 per cent, the remainder consisting of *d*-limonene with traces of

[1] "Chemistry of Essential Oils," Vol. I. (1918), 393.

aldehyde, C_8 and C_9, citronellal, methyl heptenone, etc. The principal adulterants of this oil are the terpene residues obtained during the manufacture of concentrated oil. It is well known that essence of lemon is prone to deterioration on keeping, especially if exposed to air and light. To reduce this to a minimum the oil should be stored in well-filled, air-tight containers.

The terpeneless oil is about sixteen times concentrated, and is useful up to about 0·1 per cent in artificial rose ottos. For a full and comprehensive survey of the lemon oil industry reference should be made to the special number of the *Perfumery and Essential Oil Record*, published July 12, 1922.

Lentisk—*see* Mastic.

Licareol—The original name given to *l*-linalol obtained from bois de rose oil.

Lilac perfumes are usually mixtures of synthetics with the odour of terpineol predominating. The following formula will be found fairly representative of the type :—

Terpineol	700 c.c.
Phenyl ethyl alcohol	100 „
Hydroxy-citronellal	100 „
Benzyl acetate	20 „
Methyl anthranilate	20 „
Tolu R.	60 „

For further details reference should be made to the monograph on Lilac.

Lilacine is a name given to terpineol, alone or mixed with linalol, etc.

Lily—The reproduction of this odour has been materially facilitated by the introduction of hydroxy-citronellal (known as lily aldehyde). In combination with linalol, terpineol, and small quantities of jasmin a delightful lily perfume is obtained. The following composition will be found useful and may be varied to suit individual tastes :—

Hydroxy-citronellal	400 c.c.
Linalol	150 ,,
Terpineol	150 ,,
Jasmin absolute	50 ,,
Ethyl phenacetate	45 ,,
Civet extract, soluble 10 per cent	50 ,,
Rhodinol	100 ,,
Ylang-ylang oil—Manilla	50 ,,
Cardamon oil—English	3 ,,
Benzaldehyde	2 ,,

Mature at least one month.

A more detailed account of the lily will be found on reference to the monograph.

Lime Blossom—*see* Tilleul.

Limes Oil of commerce is imported principally from Montserrat, in the West Indies, where it is obtained, both by expression and distillation, from the rind of *Citrus medica*, var. *acida*, N.O. Rutaceæ. The latter process yields an oil of inferior odour resembling turpentine, and due probably to the presence of traces of **cymene**. This results from the decomposition of citral and is unavoidable, since the main article for export is *lime juice*, and during its concentration the organic acids present react on the oxygenated constituents of the oil, which is afterwards separated from the aqueous distillate. Another oil, *i.e.* Italian **limette oil**, is only occasionally met with, and is obtained solely by expression from the peel of *Citrus limetta*, N.O. Rutaceæ. These oils contain up to about 25 per cent of linalyl acetate, together with citral, linalol, and limonene. A yellow deposit is thrown down on standing and is known as **limettin**.

Lime oil is, of course, much used as a flavouring agent, and in recent years has been employed in place of lemon oil in eau-de-Colognes, especially when they contain coriander. Citral from lime oil is obtainable, and 0·1 per cent of it is useful for producing a delightful freshness in almost any floral otto.

E. J. Parry[1] has examined an oil distilled from the *flowers* of the Italian lime tree, in which he found linalol and methyl anthranilate.

Limonene is a hydrocarbon occurring in many essential oils, notably in those of lemon, orange, and bergamot. It is a colourless or pale yellow liquid of sweet lemon-like odour, and is useful in preparing artificial neroli or mandarin oils. **Dipentene** is the racemic form of the optically active *d*-limonene and *l*-limonene.

Linaloe Oil is obtained by distillation from the wood of trees of the N.O. Burseraceæ. The principal seat of the industry is Mexico, where the natives are said to recognise three kinds of raw material, *viz.*, "fine, common, and caraway linaloe." The oil of commerce is colourless to pale yellow and has a pleasant "woody" odour. It contains a large proportion of linalol and is a source for this article of second quality. Both are used more in the soap industry than in fine perfumery. For this purpose **cayenne linaloe oil** (bois de rose femelle) is almost invariably employed. It is distilled in French Guiana from the wood of a tree, either *Protium altissimum*, March, N.O. Burseraceæ, or *Ocotea candata*, Mez, N.O. Lauraceæ. It is a colourless oil with a sweet, soft aroma, and contains 60 to 90 per cent of linalol, which is useful as a base in bouquets of the lily type. It is also valuable for attenuating the odour of any sweet perfume, *e.g.* aubépine, honeysuckle, corylopsis, eglantine, jonquille, muguet, and rose.

Linalol occurs in the free state in bois de rose oil and in the form of esters in numerous essential oils, notably in those of lavender, bergamot, petitgrain, and rose. It is isomeric with geraniol and nerol. This alcohol is a colourless liquid with a soft sweet odour and is useful in the preparation of numerous artificial floral oils. In particular it enters the composition of lily, lilac, rose, and neroli,

[1] "Chemistry of Essential Oils," Vol. I. (1918), 419.

while the following formula will give an example of its use in a fancy bouquet :—

Linalol	350 c.c.
Santal wood oil—English	150 „
Patchouli oil	80 „
Vetivert oil—English	10 „
Beta ionone	125 „
Coumarin	50 grams
Vanillin	30 „
Rose synthetic	100 c.c.
Benzoin R.	100 „
Aldehyde C_{14}	5 „

Linalyl Acetate is found naturally in numerous essential oils, and, in addition to those mentioned under linalol, it has been identified in the oils of jasmin and gardenia. It may be prepared artificially by the action of acetic anhydride on linalol and is the most important ester. Linalyl acetate is a colourless oil, and in some samples the bouquet is almost identical to that of terpeneless bergamot oil. This ester is also useful in many other artificial perfumes, such as jasmin, syringa, tilleul, ylang ylang, and cheap Cologne. An example of a synthetic bergamot follows :—

Linalyl acetate	400 c.c.
Limonene	500 „
Linalol	60 „
Terpinyl acetate	40 „
Chlorophyll	q.s.

Linalyl Benzoate and **Cinnamate** are very useful in oriental perfumes, especially those for perfuming face powders, creams, etc. Both have the heavy type of odour and are liquid.

Linalyl Butyrate is an oil having a characteristic butyraceous odour resembling citronellyl butyrate, and is used for obtaining a fruity note in floral ottos.

Linalyl Formate and **Propionate** are liquids having very sweet odours, resembling bergamot, but, if anything, more penetrating. Their use is similar to that of the

acetic acid ester. The formate is quite a viscous oil, and its odour is more pungent than the propionate.

Linden Blossom—*see* Tilleul.

Logwood is the heartwood of *Hæmatoxylon campechianum*, N.O. Leguminosæ, a tree growing in Honduras, Jamaica, etc. The principal constituent is *Hæmatoxylin*, which occurs to the extent of about 10 per cent and is used as a dye.

Lonicera—*see* Honeysuckle.

Lotos is an ancient Egyptian name for a plant growing in the Nile, of which the Greek historian, Herodotus (B.C. 413), who visited Egypt, says: "When the river swells, great numbers of lilies, which the Egyptians call lotos, shoot up through the water. These they cut down, and after they are dried in the sun, take out the heart of the plant, which resembles a mekon (poppy); they mould it into paste and bake as bread. They likewise eat the lotos (the tuberous root), which is round, and equal to an apple in bigness." This appears to be the *Nymphea lotus* of Linnæus, the white water-lily of Egypt, the representative of the white water-lily of this country, *Nymphea alba*. Lotos perfumes are mixtures of linalol and phenyl ethyl alcohol with traces of patchouli and aldehyde C_{14} suitably fixed with amber and benzoin R. (*see also Nelumbium speciosum*).

Lotus Jacobea is a small shrub, native of Cape Verd, remarkable as being one of the few plants that have truly black flowers.

Lotus Odoratus and **L. Corniculatus**, commonly called birdsfoot trefoil, is a variety of clover, with faintly perfumed yellow blossoms. The seed pods are exactly like a bird's foot, hence its common name.

Lyseol is a mixture of synthetics with a sweet floral odour.

Mace Oil is the essential oil distilled from the arillus of the nutmeg. It closely resembles oil of nutmeg, but contains a larger proportion of oxygenated constituents.

Magnesium Stearate has been recently introduced into cosmetics. Its properties resemble those of zinc stearate (*which see*).

Magnolia is the name of a genus of trees and shrubs native to China, Japan, and North America. The flowers are delightfully fragrant and have given rise to synthetic oils of this name, which usually consist of jasmin, neroli, and rose, with traces of ionone and benzaldehyde—*see* Monographs.

Maize Starch obtained from *Zea mays*, N.O. Graminaceæ, is a useful base for cheap face powder. For those of high-class quality it is replaced largely by rice starch (*which see*).

Mandarin Oil is obtained from the peel of the fruit of *Citrus madurensis*, N.O. Rutaceæ. It is a yellow liquid with an orange odour and contains limonene. It is sometimes used in eau-de-Cologne in place of orange oil.

Marjoram Oil is obtained by distillation from the fresh herb, *Origanum majorana* or sweet marjoram, N.O. Labiatæ, grown principally in Spain—*see* Origanum Oil. It has a most tenacious odour.

Marjorana is a fancy bouquet which appears to be an amber mixture with traces of bergamot, nerolin, and methyl heptine carbonate.

Marsh Rosemary Oil is distilled from *Ledum palustre*, N.O. Ericaceæ, a herb grown in Silesia. Messrs. Schimmel & Co.[1] obtained a yield of 0·33 per cent of a lemon-yellow oil which recalled the odour of coriander and worm seed oils.

Mastic is a hard, resinous exudation obtained by incision from the bark of the stem and branches of *Pistacia lentiscus*, N.O. Anacardiaceæ. It occurs in rounded, irregular, or

[1] "Report" (1919), 35.

pear-shaped tears of a pale yellow colour, either opaque or glassy in appearance. It has an agreeable balsamic odour, recalling turpentine, and a strong tincture is useful as a fixative in honeysuckle, lavender, mimosa, and sweet-pea perfumes. About 2 per cent of volatile oil is obtainable from this resin.

Matthiola Bicornis—*see* Stock.

May Blossom—*see* Hawthorn and Aubépine.

Meadow Sweet, or *Spirea ulmaria*, is a common plant found in meadows, hedgerows, and on the banks of streams in England. The flowers possess an almond-like fragrance, which is attributed to the presence of salicylic aldehyde.

Mecca Balsam, also known as balm of Gilead, is now rarely met with in commerce. It is believed to be obtained by incision from *Balsamodendron opobalsamum*, N.O. Burseraceæ, and is a fragrant yellowish viscid liquid containing about 30 per cent of volatile oil. It is esteemed by the eastern nations as a medicine, and is stated to be used by the Egyptian perfumers for obtaining some of their Arabian blends.

Meillone is a proprietary base for rose and acacia.

Melilot (*Melilotus officinalis*) is a clover-like annual or biennial of the N.O. Leguminosæ, widely distributed throughout Europe and Western Asia. It is chiefly met with among bushes, and its fragrance, though not so powerful, resembles that of the sweet woodruff. Its odour is most noticeable when dry, and appears to be due to derivatives of coumarin. It is used for flavouring Gruyère cheese.

Melissa Oil, also known as balm oil, is obtained by distillation from the leaves and tops of *Melissa officinalis*, N.O. Labiatæ, a herb native of the countries bordering on the Mediterranean and also cultivated in the United States. Its odour recalls a mixture of citronella and verbena. The

commercial product is believed to be obtained by distilling lemon oil over the herb, citronellal in some cases being added. Schimmel & Co.[1] say that it may even be a fractionated citronella oil.

Menthol occurs in fine, colourless, acicular crystals, and is the distinctive alcohol in oil of peppermint. It is separated on cooling from the freshly-distilled product in Japan, etc. Menthol is largely employed in medicine, and is particularly useful in dental creams for obtaining that peculiar freshness after application to the teeth. In small quantities and if well covered, it will enhance the cooling properties of solid eau-de-Cologne.

Menthone is the characteristic ketone found with menthol and menthyl acetate in oil of peppermint.

Methylacetophenone is a colourless or pale yellow liquid with a very fragrant odour, and is obtained artificially by condensing toluene with acetic anhydride. It is an indispensable article in the preparation of all mimosa perfumes and blends well with terpineol, benzyl formate, iso-butyl salicylate, and rose. In traces para methyl acetophenone is useful for giving especial characteristics to cassie bouquets. Its odour is similar to that of para methyl tolyl ketone.

Methyl Anisate is a crystalline substance, melting at 45° C. and having a sweet odour recalling that of the aromatic herb *Anthriscus cerefolium*. It is used for giving "body" to fancy perfumes, and is sometimes employed in hawthorn compositions.

Methyl Anthranilate is a crystalline body, melting about 24°-25° C., and in solution has a characteristic violet-blue fluorescence. It possesses a sweet odour of orange flower, and is indispensable for reproducing pseudo-neroli oils. This body has been identified in many flower oils, among which may be cited neroli, ylang ylang, jasmin, wallflower, and tuberose. When mixed with other synthetics its odour

[1] "Report" (1917), 105.

almost disappears, but on standing a few hours even small quantities become apparent. As much as 15 per cent may be used in cheap artificial nerolis, as the following formula will show, but for better quality oils the addition of terpeneless petitgrain oil (French) is desirable :—

Phenyl ethyl alcohol	500 c.c.	
Linalol	300 „	
Linalyl acetate	40 „	
Methyl anthranilate	150 „	(melted)
Aldehyde C_{10}	10 „	

Methyl Benzoate, also known as **Niobe Oil**, is a colourless and powerfully odorous oil (rather harsh), prepared by passing dry HCl gas through a solution of benzoic acid in methyl alcohol. In combination with vetivert, oakmoss resin, and labdanum, it is useful as a base for peau d'espagne perfumes, while in traces with para cresol methyl ether it is an important adjunct in preparing artificial ylang ylang oil.

Methyl Cinnamate is a white crystalline compound, melting at 36° C., with a heavy fruity odour recalling strawberry. It is useful as a fixative in eastern compounds and amber Cologne, but is not valued so highly as the ethyl ester of cinnamic acid, which has a softer and sweeter odour.

Methyl Decine and **Undecine Carbonates** are liquids having similar properties to methyl heptine carbonate. They possess, however, a distinct waxy odour which makes them useful in reproducing perfumes such as iris, jonquille, and tuberose.

Methyl Heptine Carbonate, commonly called "vert de violette, artificial," is a colourless ethereal oil, which in the pure state has a distinctly obnoxious aroma. This body plays an important part in the reproduction of violet perfumes, especially those of the "leafy" type. Its use requires considerable moderation, and for ordinary violet oils 1 per cent

should not be exceeded, one month at least being required to completely blend it with ionone, orris, ylang ylang, and santal. In other floral bouquets this synthetic is useful for imparting " freshness."

Methyl-Heptenol is a sweet-smelling alcohol useful in rose bouquets and oriental creations.

Methyl-Heptenone has an odour resembling that of iso-butyl acetate and occurs in verbena and lemon-grass oils. It is a colourless liquid and not much used in fine perfumery. It is, however, employed in the soap industry.

Methyl Ionone is a colourless or pale greenish-yellow liquid having an odour recalling irone. It is useful for shading violet bouquets of special type and is also of value in producing iris perfumes.

Methyl Iridate is a colourless or greenish-yellow liquid, having an odour resembling methyl ionone but of different tone. It recalls the delicate odour of violet, reseda, and orris root, and as it boils at 155° C. (12 mm.) is a useful fixative for this type of perfume.

Methyl Iso-Eugenol is a colourless to yellowish liquid and possesses similar properties to iso-eugenol. It is useful in the carnation type of perfume.

Methyl Myristinate is a liquid having a remarkably powerful odour and is very useful in violet bouquets, especially those intended for perfuming powders.

Methyl Naphthyl Ketone is a white crystalline compound melting at 54° C. It has a pleasant odour recalling orange blossom and is sweeter, smoother than, and much superior to, the naphthol ethers. It can be successfully employed in the manufacture of synthetic neroli or even eau-de-Cologne. The following formula will illustrate its use in the former case :—

Methyl naphthyl ketone	100 grams
Methyl anthranilate	100 c.c. (melted)
Linalol	200 „
Bergamot oil, terpeneless	100 „
Phenyl ethyl alcohol	100 „
Citronellyl formate	25 „
Alcohol C_{10}	20 „
Indol	5 grams
Hydroxy-citronellal	50 c.c.
Petitgrain oil, terpeneless	300 „

Methyl-nonyl-acetic-aldehyde is an expensive and powerfully odorous liquid having an odour recalling slightly that of orange. It is recommended in traces, for giving distinction to new fancy bouquets, especially when a fresh, flowery note is desired. It is also employed in jasmin bouquets.

Methyl Octine Carbonate is a liquid which in dilute solutions possesses a fresh violet leaf smell. It is more stable and more pungent in the pure state than methyl-heptine carbonate.

Methyl Para Tolyl Ketone is a recently introduced synthetic which promises to have a great future in perfumery. It is a colourless liquid having an almondy odour resembling **Coumarin**, but two or three times as powerful, and also recalling methyl acetophenone. It blends well with patchouli, oakmoss, ylang ylang, and geraniol ex palmarosa, and will replace coumarin very effectively in any foin coupé perfume. Mere traces of this synthetic in violet, lily, and mimosa floral ottos will make their reproduction very difficult. In conjunction with iso-eugenol, santal, and patchouli it is possible to build up new fancy bouquets of oriental type.

Methyl Phenyl Acetate is a liquid with a honey-like, somewhat musky odour, and is useful in rose-eglantine compounds.

Methyl Phenyl Glycidate of Ethyl is a colourless liquid of fragrant odour having a distinct resemblance to

strawberry. Traces of it are useful for obtaining a new note in fancy bouquets.

Methyl Phenyl Propionate is an oil of pleasant odour, and is useful in fancy bouquets of the jasmin type.

Methyl Salicylate, or artificial wintergreen oil, is the principal constituent of the oil from *Gaultheria procumbens* and *Betula lenta*. It is artificially prepared on a large scale by the condensation of salicylic acid and methyl alcohol in the presence of sulphuric acid, and is of considerable value in medicine. It is also an important flavouring agent for dental preparations and in perfumery can be usefully employed in synthetic cassie and chypre.

Mignardise (in French, delicate, pretty) is a fancy perfume which appears to be a mixture of iso-eugenol, phenyl ethyl alcohol, and benzyl acetate with traces of oil of pepper.

Mignonette (*Reseda odorata*) is a native of Egypt and the shores of the Mediterranean, and is cultivated in the south of France for its perfume, which is extracted from the fresh flowers by volatile solvents. This extract will yield traces of a powerfully scented essential oil, whose odour recalls violet leaves. The synthetic body, ethyl decine carbonate, has an odour which resembles reseda and is used in conjunction with orris, methyl ionone, basil, and santal oils for the reproduction of pseudo-mignonette ottos. For formulæ and further details reference should be made to the monograph on Reseda.

Mimosa.—Perfumes of this name usually resemble acacia or cassie. Since the introduction of methyl acetophenone (*which see*) it has been possible to more accurately represent the flower odour, and terpineol and hydroxycitronellal are usually blended with this synthetic—*see* monographs for further details and formulæ.

Mirbane Oil is nitrobenzol, and has been found as an adulterant of essential oil of bitter almonds.

Mock Orange—*see* Syringa.

Mousse de Chêne—*see* Oakmoss.

Muguet—*see* the monograph on Lily.

Muguettine Principe—*see* Hydroxy-citronellal.

Muscade—*see* Nutmeg.

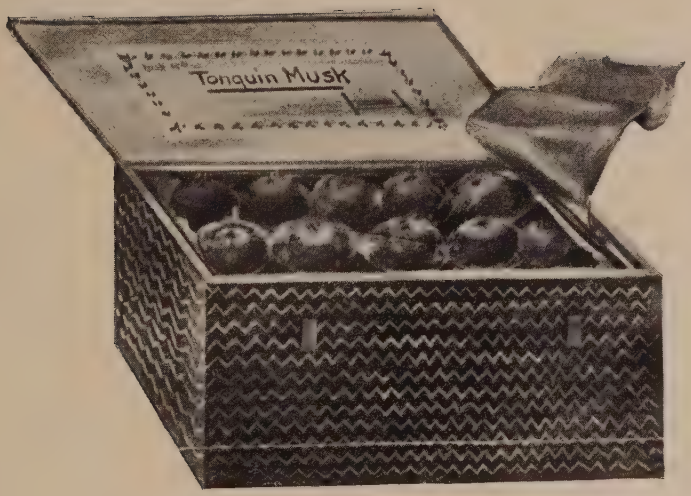
Muscatel Sage Oil—*see* Salvia sclarea.

Musk is the dried secretion from the preputial follicles of the male musk deer, *Moschus moschiferus*, which inhabits the mountainous districts of the Atlas and Himalayan ranges. It occurs in commerce in four well-defined varieties as follows :—

1. Tonquin.
2. Cabardine.
3. Yunan.
4. Assam and Nepaul.

Of these the foremost place is undoubtedly held by **Tonquin Musk**, coming from *Thibet*, and it accounts for about 85 per cent of the total imports. It arrives on the London market in boxes as illustrated here. They are quite elegantly finished, the exterior being covered with silky material of peculiar design and the interior lined with metal—usually lead. These containers are known as "catties," and generally represent about 22 oz. weight of musk. Each **Musk Pod** is sometimes wrapped in tinfoil, and consists of a nearly round sac, about one and a half inches in diameter, which is almost smooth on one side and covered on the other with dark appressed hairs, concentrically arranged around a nearly central orifice.

Blue Pile musk is generally the most esteemed form in which this perfume material may be purchased, but it is said to be ordinary Tonquin musk which has undergone transformation at the hands of expert



[*Hobbs.*

FIG. 5.—A "Cattie" of Tonquin Musk.

[*To face page* 88.

natives in Shanghai. The inner side of the skin covering is deftly removed, and this leaves a bright "steely" blue membrane.

Grain Musk consists of the dried secretion, together with hairs, etc., which is carefully removed from the pod. The grains are irregular and unctuous, of a reddish-brown to black colour, and exhale a characteristic, penetrating, and persistent odour. They should not contain any membrane as this is particularly prone to putrefaction.

Cabardine Musk occurs in two varieties, Chinese and Russian, but both are inferior to the above.

Yunan Musk occurs in what are often termed "pig-faced pods," and are easily differentiated from the Tonquin by their shape. It is imported both in the natural pod and in the blue pile—this variety being a specially prepared article as referred to above.

Assam and Nepaul Musk occurs in very small pods, but these varieties are not much esteemed.

Adulteration.—Musk is liable to adulteration with earth, dried blood, etc., but this will be indicated on incineration and by microscopical examination. The limit of ash is 8 per cent, and moisture should not exceed 15 per cent, but it must be borne in mind that it will not pay the average buyer to completely examine each purchase. The best advice is "Buy from a firm of repute and accept their assurance of purity."

Odour.—The odoriferous principle which occurs to the extent of about 2 per cent has recently been isolated. It is a ketone in the form of a dark brown volatile oil, possessing an intense odour of musk and has been named **Muskone.** The perfume exhaled by this body will rapidly fatigue the olfactory nerves, but a peculiar feature of the commercial article is that it appears to completely lose its odour at times, especially if kept in a hermetically sealed

vessel for a long period. This will, however, soon redevelop in treating the pod or grains with small quantities of ammonia or other alkali.

Solubility.—Water will dissolve about 50 per cent of unadulterated musk, while from 10 to 20 per cent is soluble in strong alcohol.

Uses.—In spite of the many artificial musks, the natural raw material is undoubtedly the most indispensable article used in perfumery. It is esteemed just as much for the subtleness of its odour as for its wonderful power as a fixative, and those ottos or alcoholic perfumes that do not contain some of it are usually lacking in "life" and diffusiveness. The art in its use lies in being able to employ so little of it in fortifying the basic odour that the bouquet *appears* to remain unchanged, both during and after evaporation. The *form* in which musk may be best employed is given in detail in the chapter on fixation (*which see*).

Manipulation.—When handling this raw material considerable care is desirable since the removal of its odour from the hands and laboratory ware is a matter of some difficulty. *Camphor* and *benzaldehyde* are the two most useful articles for this purpose, and an alcoholic solution of either, applied before a soapy lather, will be found effective.

Musks, Artificial, are a series of highly nitrated tertiary butyl toluenes or xylenes, or other closely related nitro-compounds, which have no relation chemically to natural musk, but approximate to it slightly in odour value. The first variety to be commercially produced was "musk Baur," patented in 1888, and now generally described as **Musk Xylol.** The present-day product is tri-nitro-tertiary butyl-xylene, and melts at about 114° C. when pure. It was at one time much adulterated with acetanilide, but is usually sold as *Musk xylol, 100 per cent.* Its odour is musky, but modified by a sort of fatty taint. It is very useful in shampoo powder perfumes, and may be dissolved in benzyl benzoate or ethyl phthalate.

Musk Ketone is more expensive than the xylol, and is the acetyl derivative of di-nitro-butyl-*m*-xylene. It melts about 134° to 135° C., and possesses an odour more nearly approaching that of the natural product.

Musk Ambrette is probably the most important artificial product, and its odour, although persistent, recalls that of ambrette oil rather than that of natural musk. It is the methoxy derivative of musk Baur 1, or may be described as di-nitro-butyl-meta-cresol-methyl-ether. It melts about 85° C., and is soluble in three times its own weight of benzyl benzoate.

The three products briefly outlined above are very largely employed in perfumery as they are so much cheaper than natural musk. The *Ambrette* is most frequently used for fixing and blending with floral ottos (synthetics), and normally 1 per cent is sufficient. The application of this material as a base of synthetic musk perfume is shown by the following formula, which may be advantageously employed as a soft and sweet perfume for face powders :—

Musk ambrette	450 grams
Rhodinol	150 c.c.
Methyl para tolyl ketone	5 „
Ionone	25 „
Santalwood oil	50 „
Clary sage oil	10 „
Vetivert oil—English	10 „
Amyl benzoate	300 „

Directions.—Powder the musk crystals finely and rub down with the liquids—incorporate into 1000 grams of kieselguhr, and store in a well-stoppered bottle—use 1 to 4 oz. to every cwt. of toilet powder.

Other varieties of artificial musk are known, and these are described with formulæ by Noelting in the *P. and E.O.R.*, March, 1922, to which reference should be made for further details.

Musk Seed—*see* Ambrette.

Myrcia Acris—*see* Bay.

Myristica—*see* Nutmeg.

Myrrh is a gum-resin exuded from the stem of *Balsamodendron Myrrha* and probably other species of the N.O. Burseraceæ. The true myrrh or herabol myrrh is obtained from Arabia and Abyssinia, while bdellium or bisabol myrrh is usually collected in Somaliland and resembles Indian bdellium. The latter (bisabol myrrh) frequently occurs as an admixture of true myrrh. This resinous substance has an agreeable aromatic odour and on distillation yields about 5 per cent of essential oil. A tincture (1 in 5 in 90 per cent alcohol) is useful in liquid dentifrices, and a strong extract (1 in 2) is valuable as a fixative in oriental perfumes. It is also recommended for broom and honeysuckle floral ottos.

Myrtle Oil is distilled from the leaves of *Myrtus communis*, N.O. Myrtaceæ, a bushy shrub (under favourable conditions a tree of 20 ft. or more in height) found on the shores of the Mediterranean. The oil has a characteristic odour, and is present in the leaf to the extent of about 0·3 per cent. It is a useful fixative in eastern bouquets.

Narceol is a name given to a proprietary narcissus base, and is probably para-cresol-acetate.

Narcissus is largely cultivated in the Mediterranean littoral, the most popular variety being *N. Jonquilla*, N.O. Amaryllidaceæ. The perfume is extracted by enfleurage and volatile solvents. Artificial narcissus is a mixture of phenyl ethyl alcohol, terpineol, methyl ionone, benzyl acetate, and linalol, with up to 10 per cent of phenyl acetic aldehyde. Very dilute solutions of para-cresyl-acetate or phenyl-acetate have an odour resembling narcissus, and the addition of about 1 per cent of either of these bodies to any artificial narcissus oil improves it. Benzoin R. and bois de rose oil are good fixatives. See monograph on narcissus for further details.

Nard—*see* Spikenard Oil.

Nelumbium Speciosum, also known as the sacred bean in India, is a beautiful aquatic of the water lily family, and stated by some writers to be the Egyptian lotus of the ancients. The flowers, which are rose-pink or white in colour, resemble gigantic tea roses and are delightfully fragrant. They are not often found in the Nile to-day, but at one time they appear to have been common there and were held sacred by the worshippers of Isis, as is evident by the sculptures and representations of the flower found in the ruins of the ancient temples. Its worship is by no means confined to the ancient Egyptians, for in India, Tibet, China, and Japan the plant was deemed sacred, and indeed is still employed in religious invocations and ceremonies. The leaf stalks abound in spiral fibres, which are carefully extracted and made into wicks to burn before the idols, and its leaves are used as plates in which offerings are placed —*see* also Lotos.

Neral, or neraldehyde, is isomeric with Citral (*which see*).

Nerol is isomeric with geraniol, and, like this alcohol, is found in the free state or in the form of esters in several essential oils; among those of importance being rose, neroli, champaca, wallflower, ylang ylang, and *Helichrysum angustifolium*, N.O. Compositæ. Two kinds of nerol are obtainable, one from petitgrain oil, and the other by synthesis from geraniol. Nerol from the latter is manufactured by Verley[1] in the following manner. Pure geraniol is saturated with one molecule of hydriodic acid in the presence of a neutral solvent. The iodised oil obtained is treated with alcoholic soda, giving nerol. This is a colourless liquid with a sweet rose-neroli odour and is useful in compounding oils of this type. It is possible that some commercial samples contain a little geraniol.

[1] "La Parfumerie Moderne" (1920), 143.

Nerolidol is a sesquiterpene alcohol occurring in orange flower oil. It has very little odour, but can be used to fix others of this type.

Nerolin—*see* β-naphthol-methyl-ether.

Neroli Oil is obtained by distillation from the fresh blossoms of the sweet and bitter orange. The former, being known as oil of neroli *Portugal,* is not so valuable as the latter, which is described as oil of neroli *Bigarade.* Neroli oil is distilled largely in the South of France, and this product commands the highest price. Other oils are distilled in Algeria, Sicily, Spain, and Syria, but they do not possess such a delicate bouquet and are not by any means as expensive. It is a pale yellow liquid which darkens on exposure to light ; it possesses a sweet odour of fresh orange blossom, and is much used in the preparation of eau-de-Cologne. Owing to the high price of the French article, Italian oil is now largely employed for this purpose (or in some cases terpeneless French petitgrain oil, which has a fine odour approaching neroli). Among the known constituents of the genuine oil are limonene, linalol, esters of geraniol, linalol and nerol, phenyl ethyl alcohol, methyl anthranilate, and indol. Synthetic neroli is now a common article of trade, and in spite of its cheapness possesses a remarkable likeness to the genuine oil. The following formula will give an idea of a base which can be backed up with petitgrain if desired :—

Phenyl ethyl alcohol . .	300 c.c.
Nerol	550 „
Methyl anthranilate . .	120 „ (melted)
Linalyl formate . . .	25 „
Decyl aldehyde . . .	4 „
Indol	1 gram

Terpeneless neroli oil is about three times concentrated and commands a very high price. For further details regarding orange flowers reference should be made to the monograph on that subject.

Neryl Propionate is an interesting addition to the list of synthetics, and is recommended strongly for violet compositions where new and original shades are desired. It is also a valuable asset in reproducing synthetic neroli and jasmin.

Nitrobenzene is a colourless or brownish-yellow inflammable poisonous liquid, having a crude but strong odour resembling that of benzaldehyde, and is known in commerce as **Oil of Mirbane.** It is not used in fine perfumery, but is employed in the soap industry.

Niobe Oil—*see* Methyl Benzoate.

Nonanal—*see* Nonyl Aldehyde.

Nonyl Alcohol is a colourless liquid with a peculiar, characteristic sharp odour, recalling rose, with a suggestion of neroli. It has been identified as ester in orange oil. Alcohol C_9 is useful for giving special notes to synthetic rose ottos—*e.g.* rose d'orient :—

Geraniol	400 c.c.
Citronellol	300 „
Benzyl acetate	50 „
Bois de rose femelle	50 „
Nonyl alcohol	50 „
Rose virgin	150 „

Nonyl Aldehyde has been found in the oils of rose, tangerine, cinnamon, and orris. It resembles nonyl alcohol in general properties, but has a much more powerful odour of the rose type. It is indispensable in preparing artificial rose otto, and may be usefully employed in compounding synthetic neroli. Great care is required in its use, as an excess in any perfume will produce a peculiar and objectionable "acid" smell. As a general rule 1 per cent should not be exceeded, and even less will be found sufficient in many compounds. The keeping properties of pure aldehyde C_9 are not good, but it may be conveniently

preserved by mixing with an equal volume of absolute alcohol and storing in well-filled amber-stoppered bottles.

Nutmeg Oil is distilled from the dried seed of *Myristica fragrans*, N.O. Myristaceæ, divested of its testa. It is a pale yellow liquid of characteristic odour and taste, and is useful for flavouring dental preparations. Mere traces added to lavender water will produce a delightful bouquet which is exceedingly difficult to copy. The expressed oil, erroneously referred to as "oil of mace," is concrete, and contains about 50 per cent of glyceryl myristicate and 6 per cent of volatile oils, besides resin, etc. It is obtained by heat and expression from those nutmegs which are too small for sale. M.p. about 45° C.

Oakmoss Resin, or mousse de chêne, is a liquid of characteristic odour and is obtained from the lichen, *Evernia prunastri*, N.O. Parmeliaceæ, by means of volatile solvents, the resulting liquid being evaporated to a syrupy consistency *in vacuo*. It is useful in oriental bouquets, particularly those of the "poppy" type. It possesses remarkable fixative properties, and is recommended for chrysanthemum, foin coupé, fougère, orchidée, and trefle perfumes. Its use requires considerable practice, as a slight excess will frequently spoil the odour of a delicate fancy bouquet. Oakmoss is believed to have played a part in the commerce of antiquity,[1] for in ancient Egypt this lichen was an ingredient in bread making. It has been discovered in the tombs of the Pharaoh period, where baskets made of rushes were filled with both *Evernia furfuracea* and *E. prunastri*. These lichens do not occur in Egypt, where lack of moisture prevents their growth, but in the last century Forstal saw several consignments being unloaded at Alexandria. These had been shipped from the Islands of the Archipelago.

Ocimum Basilicum—*see* Basil Oil.

Octyl Acetate has been found naturally in the oil distilled from the seeds of wild parsnip. It may be artificially

[1] For a full account, *see* "La Parfumerie Moderne" (1922), 227.

prepared, and is a colourless liquid possessing an odour recalling that of orange and jasmin. Traces are useful in synthetic neroli, cassie, and jasmin.

Octyl Alcohol, the normal alcohol, probably occurs in cow parsnip oil. It may be synthetically prepared, and is a liquid with a peculiar sharp odour. It is used in the rose type of perfume, about 1 per cent being sufficient for ordinary blends. Up to 5 per cent may be used for modifying fancy bouquets.

Octyl Aldehyde occurs naturally in the oils of lemon, rose, and orange flower. It has a rather sharp, powerful odour, and is useful for giving a special note to perfumes of the jasmin and rose type.

Octyl Butyrate has been found in the rhizome of male fern. It is an oil with a heavy fruity odour and is not much used.

Œillet is the name frequently given to carnation flower oils. They are mixtures of synthetics, with either eugenol or iso-eugenol as the base (*which see*).

Œnanthic Ether is ethyl heptoate.

Olea Fragrans, also known as *Osmanthus fragrans*, is a shrub of the N.O. Oleaceæ. It is a native of the Far East, where it is cultivated for the sake of its sweet perfumed flowers called "Kwei Hwa." These are used as a flavour in tea.

Olibanum is a gum-resin obtained from *Boswellia Carterii* and other species[1] of the N.O. Burseraceæ, by making incisions into the inner bark of the tree. It occurs in the form of round or ovate tears, which vary in size from one-eighth to about one inch in diameter. They are colourless to pale yellow, possess a characteristic balsamic odour, and

[1] For these see paper by E. M. Holmes, *P. and E.O.R.*, 7 (1916), 78.

yield from 5 to 10 per cent of volatile oil. Only about 60 per cent of the gum-resin is soluble in 90 per cent alcohol, the insoluble portion consisting principally of calcium and magnesium arabinate, with some bassorin. Olibanum is also known as **Frankincense** and **Gum Thus,** but the latter description in the drug trade is held to mean the oleo-resin which is scraped off the trunks of *Pinus palustris*, N.O. Coniferæ, a tree grown in Central America. Olibanum is obtained from Arabia and the Somali country, and was the frankincense of the ancients. It is widely used in the preparation of incense and fumigating preparations. In perfumery it is esteemed for its marvellous fixative properties, being employed in comparatively large proportions for the heavy oriental type of scent, while in traces it is recommended for champaca and genet floral ottos. A convenient form in which to employ this valuable natural product is as a strong alcoholic extract (1 in 2), the gum-resin being reduced to powder before maceration. An excellent fixative base for oriental perfumes is made with this alcoholic extract as follows :—

Olibanum R.	200 c.c.
Benzoin R.	200 „
Rose synthetic	200 „
Heliotropin	100 grams
Coumarin	50 „
Vanillin	50 „
Musk ambrette	50 „
Orris oleo-resin	20 c.c.
Iso-eugenol	20 „
Labdanum R.	10 „
Amyl benzoate	100 „

Olivil is the crystalline constituent of the resin of the wild olive. It forms a thick vapour on heating, and has a pleasant odour, resembling that of vanillin. It is employed in Italy for the fumigation of sick rooms.

Oponacine is a proprietary perfume possessing the fixing properties of patchouli, vetivert, and ylang ylang.

Opoponax is a gum-resin probably obtained from some umbelliferous plant whose botanical source does not appear to have been definitely established. It is attributed to *Balsamodendron kataf*, a tree attaining a height of 20 ft., which is a native of Arabia. Unfortunately, however, the genuine opoponax is practically unobtainable at present, but an oil, derived from the gum-resin of either *Opoponax chironium*, or *Commiphora erythræa*, or *glabrescens*, is sold under this name. It is a dark brown, viscous liquid, with a characteristic odour recalling a mixture of myrrh, galbanum, and ammoniacum, but is by no means as fragrant as the gum-resin formerly sold as opoponax. Floral ottos described as "opoponax" may be prepared on the following lines :—

Bergamot oil, terpeneless	450 c.c.
Geranium oil, French, terpeneless	50 „
Rhodinol	100 „
Musk extract soluble 10 per cent	100 „
Violet synthetic	60 „
Jasmin synthetic	40 „
Rose oil, virgin	50 „
Vanillin	50 grams
Musk ambrette	30 „
Citral (from lemon oil)	20 c.c.
Opoponax R.	50 „

Orange Flowers—*see* the monograph and Neroli Oil.

Orange Oil is obtained from the peel of *Citrus aurantium*, N.O. Rutaceæ, by the same processes as oil of lemon. Two kinds of orange oil are met with in the drug trade—the sweet and the bitter—both are similar in composition and odour. At one time practically all the supplies of orange oil came from Sicily, but to-day considerable quantities are imported from the West Indies (the latter at competitive prices). The use of this oil in perfumery is almost confined to eau-de-Colognes, where it frequently replaces, in part, genuine neroli oil. For cheap Colognes, mixtures of terpeneless petitgrain of France with terpeneless orange oil will be found to give better results than Italian

neroli oil. Terpeneless orange oil is forty times concentrated. The principal constituent of the natural oil is limonene, about 90 per cent, together with small quantities of linalol, terpineol, citral, citronellal, methyl anthranilate, nonyl alcohol, and decyl aldehyde.

Orchidée is a name given to perfumes of which either amyl or iso-butyl salicylate is the base. They are very similar to trefle compositions (*which see*). A reference should also be made to the monograph on Orchids.

Oregon Balsam Oil—*see* Douglas Fir Oil.

Origanum Oil is distilled from the herb of *Origanum vulgare* and other species, N.O. Labiatæ, grown in Europe, Asia, and Northern Africa, and should not be confused with sweet marjoram oil from *Origanum majorana* (*which see*). The following bodies have been identified in origanum oils from various sources : carvacrol, thymol, linalol, cymene, and terpenes. **Red Oil of Thyme** is imported and sold as origanum oil. It is often adulterated with oils of spike lavender and turpentine—coloured with alkanet.

Orris is the rhizome of *Iris germanica*, *I. pallida*, and *I. florentina*, N.O. Iridaceæ, collected in the latter part of the summer, peeled, and dried in the sun. All three species are widely cultivated on the northern shores of the Mediterranean and other parts of Europe, Morocco, etc. The best quality roots are obtained from *Iris pallida* in Tuscany, and principally constitute the Florentine orris root of commerce. It is, of course, well known that *Florentine* rhizome is not synonymous with the root of *Iris florentina*, but includes all three varieties. The following account of the cultivation of the iris is acknowledged to the *P. and E.O.R.* (1922), 270 :—

" The *Iris pallida*, from which the orris root of commerce is obtained, is grown in the districts surrounding Florence and Siena, in Tuscany. The dry, sun-baked Florentine hills seem peculiarly adapted for the cultivation of the iris,

where other plants would be much less remunerative. Comparatively unimportant plantations of iris are scattered over Northern Italy, particularly in Verona.

"The most renowned district for the cultivation of iris is that of which the village of San Polo is the centre. Here the iris represents a source of wealth on a level with the olives and wine for which Tuscany is justly world-famous, for it is precisely in this district that the famous Lucca olive oil and the even more renowned Chianti wine are obtained. The farmers in San Polo sell their orris root to merchants in Florence, Milan, and Leghorn, who export it to Grasse, England, and Germany.

"It may be said that practically every farmer in San Polo grows iris as one of his crops, and from it he obtains the flowers, bulbs, and roots. The bulbs arise from the 'eyes' that develop in the root, and vary in number according to whether the plant is a two-year or three-year plant. They are used exclusively for reproduction, and for this purpose they are removed from the root in such a way as to leave a part of the root still adhering to them, as otherwise they are useless. The flowers are sold for ornamental purposes; the seeds do not reach maturity, and after cutting the flowers the root undergoes more rapid development and becomes richer in its aromatic principle.

"In San Polo the fields given over to iris have a southern aspect to ensure the greatest amount of sunshine. As soon as the previous crop is cleared up, the ground is harrowed and then levelled off. By the middle of September the bulbs are ready for planting. A man digs small trenches about 4 in. deep and 12 in. apart; he is followed by a boy who plants the bulbs about 10 in. apart in the trenches, and great care must be taken in this operation to see that the root adhering to the bulb is at the bottom of the trench. The bulbs are covered by the soil thrown up when the next trench is dug. The bulbs used are those gathered in the previous May or June, and about 80,000 are required for each acre of ground. A man and boy can plant about 6000 per day working in the above manner.

"No particular manure is required. Phosphates have been tried without success; it was found that larger leaves only were obtained, whilst dung gives rise to rot. On the other hand, previous crops—specially lupinella—are sometimes dug in and act as manure, whilst this operation also serves to render the soil free from weeds and better adapted for the development of the rhizome.

"The harvest is gathered in June to August, when the season is dry and the roots well developed. The plant is taken up and the rhizome is separated from the bulbs and freed from the roots. The bulbs are laid out in the open, with a covering of leaves over them, in preparation for their planting in the next season.

"The rhizomes are immersed in clean water to free them from adhering earthy matter, and following this they are decorticated. This operation is called 'mondatura' locally, and is performed by women provided with small curved knives. Decortication by machinery has been attempted, but owing to the great irregularity in shape of the rhizomes, success has not been achieved so far. The machine consisted of a sharp circular knife, against which the peasant girl placed the rhizome to be decorticated. To anyone acquainted with the work it will be evident that by this means proper decortication can only be obtained with great waste of valuable rhizome, whilst economy can only be effected at the expense of incomplete removal of the cortex, so that the operation is done by hand.

"The decorticated rhizomes are again cleaned in water and then exposed on straw mats to dry in the sun. They are occasionally turned, in order to expose different surfaces, and thus effect uniform drying. Desiccation is effected in artificially-warmed and well-ventilated chambers only when the weather is wet. It is customary to leave the rhizomes in the open during clear, calm nights, in order to make them whiter, the result (it is said) of the action of the morning dew. When perfectly dry the rhizomes are ready for sale.

"The labour required for the cultivation is comparatively little during the early stages; the planting of the bulbs and

the attention given them does not absorb much labour, which at that time is well occupied in the production of olive oil, wine, etc. In the summer, when the vines and olives require little attention, the iris harvest and the subsequent cleaning and decorticating of the rhizomes absorbs practically all the locally available labour.

"The Florentine hills, in which San Polo is situated, produce by far the greater part of the total production of orris root. In an average season about 300 tons represents the San Polo production, an acre of land yielding about 1 ton.

"The rhizome is worked up for the various orris products in Milan, Grasse, London, etc., and also, before the war, in Germany. The manufacture is, however, chiefly centred in Grasse.

"Powdered orris root is largely used in *Violet powder* on account of its delicate violet perfume. It is also useful in dental preparations, and can be employed as a constituent of face powders up to 10 per cent. It is the basis of many violet sachet powders."

Orris Oil occurs in commerce as both **Concrete** and **Liquid**. The former is the more popular article, and is obtained by distilling the various rhizomes with superheated steam. The yield of oil is small, only about 0·1 to 0·2 per cent being obtained. This product is a solid fat at normal temperatures and melts about 45° C. Approximately, 85 per cent of concrete oil of orris consists of the completely odourless *myristic acid*, while the remaining 15 per cent is made up of **Irone** (the violet-like ketone), with traces of the esters of myristic and oleic acids, etc. A large proportion of the oil of commerce is produced in the neighbourhood of Grasse, either from rhizomes grown there, or more frequently by distilling the roots imported from Tuscany. These two kinds are easily distinguishable, the French root yielding an oil with a much more delicate violet-like aroma. The Florentine orris, however, produces a far more expensive and odoriferous oil which will go further in blending violet ottos. **Liquid** orris oil may be one of two kinds, either the

natural *concrete* from which the solid inodorous constituents have been separated, or a liquid obtained by distilling orris roots with cedar-wood oil (more often direct admixture of the concrete oil with this or other slightly odorous oils). Orris oil is extensively employed for blending with ionone, as a base for violet compositions. It is also useful in other floral ottos of this type, such as reseda or cassie, and may be used with advantage in opoponax and lavender perfumes. The peculiar application of this valuable product is illustrated by the following formula for *Iris-Rose* :—

Rose synthetic	600 c.c.
Methyl ionone	100 „
Vanillin	25 grams
Violet synthetic	200 c.c.
Amber liquid	15 „
Aldehyde C_{12}	5 „
Vetivert oil—English	5 „
Patchouli oil—English	10 „
Orris oil, concrete	40 grams

Orris Oleo-Resin is obtained from the rhizome by extraction with acetone or other volatile solvent. It is a remarkable fixative for lavender water and violet perfumes, but is only used in high-class products.

Orris Resin is an inferior product and is recommended for cheaper perfumes and soap.

Orseille is cudbear (*which see*).

Os Sepiæ is the calcareous growth obtained from the common cuttle-fish, *Sepia officinalis*, N.O. Cephalopoda. It consists principally of calcium carbonate and is used in tooth powders.

Otto of Rose—*see* the monograph on Rose.

Palmarosa Oil is produced in India by the distillation of the grass *Cymbopogon martini*, N.O. Graminaceæ, of which there are two kinds, "Motia," and "Sofia." The name *Rusa* grass is applied to both varieties by the natives,

the former being most esteemed (motia = precious, sofia = mediocre) on account of its yielding palmarosa oil. The latter is the source of ginger-grass oil. The grass begins to bud towards the end of August and flowers during September and October. Distillation is carried on during this period, the earlier collections producing a higher yield of superior oil. The major portion of this oil is distilled in the Bombay Presidency and the central provinces, comparatively crude apparatus being used. For many years it entered Europe *via* Turkey, and this appears to account for the appellation "Turkish Geranium Oil." It is a colourless to pale greenish-yellow liquid, with a soft sweet odour recalling rose-geranium. It is the source of the finest commercial geraniol, which occurs to the extent of from 75 to 90 per cent. Schimmel & Co.[1] have examined oils distilled in Java, which showed a high geraniol content. Palmarosa oil is a useful adjunct in preparing almost any perfume of rose type.

Palo Santo is the name given by the natives of South America to holy wood, *i.e.* guaiac wood (*which see*).

Pandanus Oil is obtained from the flowers of *Pandanus odoratissimus*, N.O. Pandanaceæ, a plant growing in India, Arabia, and Persia. It is stated to have a very pleasant, honey-like odour.

Paraffin Dur or Hard Paraffin is a mixture of the harder members of the paraffin series of hydrocarbons. Its chief source is the crude tarry oil obtained by the destructive distillation of shale. It is a colourless, semi-transparent, inodorous body, with m.p. about 56° C. It is employed in preparing several toilet articles, notably lip-salves.

Paraffin Liquid is a purified, clear, oily liquid obtained from petroleum after the more volatile portions have been removed by distillation (at about 370° C.). It is usually

[1] "Report" (1914-15), 32.

sold according to gravity, the oil about ·890 having a considerable vogue in medicine. For cosmetics the inodorous liquid from 0·860 to 0·885 is largely employed, particularly in cheap cold creams, brilliantines, etc.

Paraffin Molle or Soft Paraffin is a semi-solid mixture of various paraffin hydrocarbons, usually obtained by purifying the residue obtained when crude petroleum is distilled and the fraction which distills between 360° and 390° C. has been separated. Soft paraffin may be yellow or white and should melt about 38° C. It is largely used in pharmacy as an ointment base while it may be employed in cosmetics in the preparation of various toilet and massage creams.

Passion Flower.—The common passion flower, *Passiflor coerulea*, N.O. Passifloraceæ, is cultivated for its gorgeous flower. It is one of an extensive genus of climbing shrubs, the greater number of which are natives of Brazil and the West Indies. *P. alata* has an exquisite fragrance.

Para-methyl Acetophenone is the basis for mimosa (*which see*), also under M.

Para-methyl-hydro-cinnamic Aldehyde possesses a very powerful odour, and is said to be useful in compounding heliotrope perfumes.

Para-methyl Quinoline is a yellowish liquid having a honey-like odour of considerable power. It may be employed for obtaining a new note or for rounding off any fancy bouquet.

Patchouli Oil is a powerfully odorous viscid liquid obtained by distilling the dried leaves of *Pogostemon patchouli* and other species of the N.O. Labiatæ. The plant is cultivated in India and the Philippines, where a large proportion of the oils of commerce are distilled. Very fine products are also distilled in England and France from imported leaves. Patchouli oil is said to be adulterated with cubeb and cedar oils, while an inferior oil obtained from *Microtæna*

cymosa, a herb cultivated in Assam, has been offered as the genuine article. It is one of the finest fixatives known for the heavy type of perfume, and in traces is useful for compounding white rose bouquets. It is also largely employed as the basis of toilet powder perfumes, of which the following is a typical example :—

Patchouli oil—English	80 c.c.
Ethyl cinnamate	30 „
Rose synthetic	240 „
Linalyl formate	50 „
Anisaldehyde	20 „
Jasmin synthetic	100 „
Heliotropin	50 grams
Coumarin	150 „
Amber liquid	50 c.c.
Benzoin R.	200 „
Oleo resin orris	25 „
Aldehyde C_{14}	5 „

Allow to mature for one month and then rub down with kieselguhr, sift, and store in a bottle. A very small quantity of this is sufficient to give any face powder a sweet, powerful, and persistent perfume.

Patchouli is also extracted with volatile solvents, and a cheap and good resinoid results.

Note.—Valuable Indian shawls used to be distinguished by their odour of patchouli, but since the perfume has become so common, this test is unreliable evidence of their genuineness.

Patchouli Camphor is an odourless constituent of patchouli oil, from which it separates in crystals that melt at 56° C.

Peach Aldehyde is aldehyde C_{14} (*see* Tetradecylic Aldehyde).

Peau D'Espagne is a perfume much used for treating leather which is intended for the manufacture of fancy goods. A piece of the material (tanned kid, chamois, etc.)

is immersed for about ten days in a mixture such as the following :—

Rectified oil of birch tar	5 c.c.
Santalwood oil	25 „
Bergamot oil	20 „
Petitgrain oil	30 „
Lavender oil	10 „
Clary sage oil	5 „
Coumarin	4 grams
Musk ambrette	1 „
Rose synthetic	10 c.c.
Iso-propyl alcohol	900 „

At the end of this period it is removed and allowed to drain. It is then spread on a sheet of glass, and after drying is coated with the following mixture by means of a brush :—

Amber liquid	150 c.c.
Olibanum R.	50 „
Glycerine	200 „
Rose water	350 „
Acacia powder	250 grams

After being treated in this manner, the leather is pressed under a weight and allowed to dry. This forms the so-called Spanish leather, or perfume skin, and will retain its odour for years. It is usually sold encased in a fancy silk or satin envelope and when placed in contact with gloves, writing paper, etc., will communicate its perfume to these objects. The formula given above can be varied at will by the use of such lasting odorous bodies as patchouli, labdanum, and oakmoss.

Pelargonium Oil—*see* Geranium Oils.

Peolia is a liquid of amber odour, and is recommended by the manufacturers for developing the power of artificial floral ottos.

Peppermint Oil is distilled from the fresh flowering plant, *Mentha piperita* and other varieties, N.O. Labiatæ.

The most highly esteemed oil is produced in England, the principal centres being in Hertfordshire, Cambridgeshire, Surrey, Lincolnshire, and Suffolk. The product is expensive, as are some oils of German origin ; these are said to approach the Mitcham variety in quality. The main sources of the world's supply are Japan and the United States, but the oils obtained from these localities do not possess so fine an aroma as the English variety, nor are they as expensive. Italo-Mitcham mint oil possesses a very fine odour, and in view of its comparatively low price is worthy of a much greater demand in this country. The following interesting account of its production is acknowledged to the *P. and E.O.R.* (July, 1922), 271 :—

" The undulating plains of Piedmont, nestling under the eternal snows of the tallest European mountain peaks—Monte Viso, the Matterhorn, Monte Rosa, Mont Blanc—attracted the attention of the Grasse pioneers about a century ago for the cultivation of peppermint, and it is said that the plant was first introduced into Piedmont from Grasse. Beyond, however, the requirements of the local small distilleries, the plant was not given much attention, with the result that it spread over practically the whole of the large well-watered plain that forms the source of the River Pò.

" The industry showed but slow progress until the year 1900, when the era of prosperity commenced. The history of Piedmont was hardly propitious for the development of industry until the time of Garibaldi ; the plains of Piedmont were ravaged time after time by the Germanic tribes in their periodic excursions to the delightful climate south of the Alps. Napoleon frequently rested his armies there after the terrible crossing of the passes that lead from Switzerland and France into Italy, and it was from Piedmont that he used to revictual and reassemble his troops during his campaign against the Austrians. It may be said that until the Garibaldi campaign of 1860 for the reunion of Italy Piedmont was in far too bad a condition of political unrest for the methodical and progressive development of any industrial enterprise. With the coming of the long Peace

that was inaugurated simultaneously with the materialisation of the Italia Riunita from the 'geographical expression' of the sneering Metternich, no part of Italy has shown such intense industrial development as Piedmont.

"The distillation of peppermint oil in Piedmont seems to have attracted serious attention about 1870. The plants were collected on the country-side and distilled in the primitive stills then in use. The demand for the oil increased, and it is said that in 1871 the firm of Varino distilled as large a quantity as 200 kilos of the oil. The development of the industry was obstructed, however, by the small yield of oil obtainable from the wild peppermint plants, as much as 7 cwt. of fresh herb yielding only 1 lb. of oil. It was entirely due to the long-sightedness of Mr. H. Carles in 1900 that the industry was able to show the extraordinary progress that has been achieved during the past twenty years. Mr. Carles was convinced of the future of the industry provided the proper raw material were provided, and this he did by importing and supplying gratis to the peasants ten sacks of peppermint roots from Mitcham. The Mitcham roots become acclimatised remarkably quickly in the Piedmont plains, and the plants suffered but slight modification from their original characteristics.

"The industry is not centred in any particular locality, although perhaps the villages and districts of Vigone and Pancalieri, near Turin, may justly claim to be the most important. Vigone has about 250 acres and Pancalieri about 500 acres out of a total of 1,500 acres given over to peppermint in the plains of Piedmont. The yield of herb is about 8 tons per acre, although this falls as low as 7 tons, and occasionally reaches 10 tons. By the cultivation of *Mentha piperita* from Mitcham, in Surrey, the production of oil has risen considerably; in an average season 1 lb. of oil is obtained from 4 cwt. of the herb instead of from 7 cwt. as before, and the total production is roughly 60,000 lb. of oil per annum.

"The cultivation of the plant appears to be a very profitable undertaking for the farmer, as at present rates it leaves

him between 80 and 100 per cent net profit on the year's work. The farmer does not, as a rule, distil the oil, but sells the plants to the distilleries that are dotted over the country-side. The apparatus, as becomes a comparatively modern industry, is refreshingly up to date. The stills are large (usually containing 6 to 10 cwt. of herb each), and are placed in rows beneath a roof supported on brick pillars. These structures have no walls. The old method of distillation by direct heat has all but disappeared, and in its place are boilers to supply the necessary steam. The condenser is invariably the serpentine type, and water obtained from wells by electricity is plentiful. The general aspect of one of these distilleries is that of a modern apparatus efficiently worked and properly looked after, whilst a detailed examination reveals the care, insight, and technical knowledge that alone make for progress. This Piedmont industry benefits also by a healthy yet friendly rivalry between the ten or twelve firms engaged in it, with the object of producing the finest oil, and as every stage in the process is under the personal care of the principals of the firms, there is every prospect of the continuation of the prosperity enjoyed during the past twenty years.

"The distillation takes place in August and occupies between twenty and twenty-five days of intense work. The stills are kept going twenty-four hours per day by different shifts of men. The herb is compressed in the still and steam is blown through for two hours to remove the oil, and in this way each still is charged ten or eleven times per day, or between 250 and 300 times during the short period devoted to the distillation of the herb. The oil is rectified at the close of the season in stills of a different kind, and the oil as usually sold is the twice rectified quality.

"It is comparatively little known in England, or, indeed, outside Italy. A fair quantity is exported to France, but the greater part is consumed in Italy in the manufacture of crême de menthe, which is in great favour among the Italians both as a digestive after dinner and as a refreshing drink when mixed with cold water. The oil is said to

stand comparison with the Mitcham, and whilst this seems to be a perhaps pardonable exaggeration, it is nevertheless true that it is of the same type and considerably superior to the American. Its price fluctuates in this country with the exchange."

Peppermint Oil is largely used as a flavouring agent for all kinds of consumable articles. It has considerable vogue in medicine, and is probably the most popular flavour for dental preparations.

Pepper Oil is obtained by distillation from the unripe fruit of *Piper nigrum*, N.O. Piperaceæ, a plant grown in the East Indies. It has an intensely pungent odour which recalls that of cubebs. It is little used in perfumery, but in traces will give an inimitable note to certain fancy bouquets.

Persic Oil is expressed from the kernels of the peach and apricot. It is known in pharmacy as *Oleum amygdalæ persic* and is useful as a basis of cold creams, skin creams in general, and glycerine and cucumber creams.

Peru Balsam—*see under* Balsam.

Peruol is a substitute for Peru Balsam and consists of a solution of Benzyl Benzoate in Castor Oil.

Peruscabin is Benzyl Benzoate.

Petitgrain Citronnier Oil is distilled from the leaves and twigs of the *lemon* tree, and has a pleasant odour quite distinct from that of ordinary petitgrain oil. Similar products are obtained from the lime and mandarin, and these are used in the Cologne type of perfume.

Petitgrain Oil is obtained by distilling the leaves and twigs of the bitter orange tree, *Citrus Bigaradia*, N.O. Rutaceæ. The finest oil comes from the south of France, and a good oil is obtained from Tunis, but the cheapest and least odorous is imported from Paraguay, where large quantities are distilled annually. The terpeneless oils, which are twice concentrated, are now in common use for the preparation of eau-de-Colognes and synthetic neroli oils.

Terpeneless Petitgrain of France possesses a very fine aroma which approximates to that of neroli oil when diluted with alcohol.

Phenetole is phenyl-ethyl-ether, and is not much used in perfumery.

Phenyl Acetic Acid is a crystalline compound melting about 76° C., and has been identified in oil of neroli. It has an odour recalling civet in extreme dilution and has been recommended in place of this article. It may be prepared by treating benzyl cyanide with dilute sulphuric acid, and in small quantities is useful in the following floral oils—acacia, trèfle, neroli, and colourless jasmin. It is a first-class fixative, and owing to its solubility in water is useful for perfuming lotions and other toilet articles.

Phenyl Acetic Aldehyde is a viscous and highly odorous liquid widely used as the base of hyacinth oils. It is prone to polymerise, but this may be prevented to some extent by the addition of 5 per cent ethyl alcohol when freshly made. This aldehyde may be prepared synthetically in several ways and is employed in compounding numerous flower oils. In addition to being the base of most hyacinths, it is useful in narcissus and jonquille and is recommended in traces for preparing special types of rose perfumes (*which see*).

Phenyl-cresyl Oxide is a crystalline body melting at 28° C., and possesses a powerful odour recalling that of lilac and orange blossom. It is useful in the reproduction of this type of perfume.

Phenyl-ethyl Acetate is a colourless, sweet-smelling liquid having an odour recalling peach, and in combination with aldehyde C_{14} is useful for reproducing this type of perfume. For obtaining "leaf" effects in floral ottos, other than those of the violet type, it will to some extent replace methyl heptine carbonate.

Phenyl-ethyl Alcohol is a colourless liquid with a "honey-rose" odour, and is indispensable in compounding any type of artificial rose otto. It occurs naturally in the oils of neroli, champaca, geranium, and rose, but the greater portion disappears in the distillation of the latter, on account of its solubility in water. In view of this fact, attar of roses cannot be said to exactly represent the odour of the fresh flower, and yet the reproduction of a really fine artificial rose otto is believed to be impossible without the addition of about 10 per cent of the natural oil. Phenyl-ethyl alcohol varies with the make and does not keep well, being partially oxidised to phenyl-acetic aldehyde ; it may be prepared by reducing phenyl-acetic esters with sodium in the presence of strong alcohol. In addition to its extensive use in preparing synthetic rose, it is employed largely in neroli and jasmin. It is also suitable as a base for any kind of sweet floral oil.

Phenyl-ethyl Formate is a liquid with a fresh eglantine odour, and is useful in this and white rose compositions.

Phenyl-ethyl Isobutyrate is a colourless limpid liquid with an odour of distinct rose type. It may be used with success in these compounds up to about 10 per cent.

Phenyl-ethyl Phenacetate is a crystalline substance melting at 27° C., with a fine hyacinth-like odour, but much milder than phenyl acetic aldehyde. It is useful in narcissus and jonquille perfumes, particularly the latter.

Phenyl-ethyl Propionate is a colourless liquid having an odour which approximates more nearly to that of dried rose petals than any ester of this series. It is useful for modifying the odour of any sweet perfume.

Phenyl-glycol Acetate is one of the newer synthetics and is very expensive. It has an odour recalling that of jasmin and muguet and is exceptionally useful in combination with hydroxy-citronellal for reproducing this type of odour. Small quantities only should be used.

Phenyl-methyl Acetate is a fragrant liquid known as gardeniol and may be usefully employed in conjunction with methyl anthranilate, benzyl acetate, linalol, and terpineol for the production of pseudo-gardenia perfumes.

Phenyl-methyl Butyrate is a liquid with a powerful fruity rose odour, resembling that of phenyl-ethyl butyrate. It is useful in certain types of rose perfumes and should not exceed 10 per cent.

Phenyl-methyl Formate is a liquid of apricot odour.

Phenyl-propyl Acetate resembles the alcohol in some respects, but has a sweeter odour. It is a colourless liquid and probably occurs in Cassia oil.

Phenyl-propyl Alcohol is a liquid possessing a sweet, mild hyacinth, reseda-like odour, and may be prepared by the reduction of cinnamic alcohol. It is useful as a basis for mignonette and will act as a substitute for reseda-geraniol. In conjunction with phenyl-ethyl phenacetate it is suitable for jonquille perfumes, and is recommended in the preparation of fancy bouquets.

Phenyl-propyl Aldehyde appears to occur naturally in Ceylon cinnamon oil but is prepared artificially. Its odour resembles that of phenyl-acetic aldehyde, being distinctly hyacinth-like, but is more pleasant and if anything less harsh. It can be used successfully in the preparation of hyacinth oils, being more stable and less liable to polymerisation than phenyl-acetic aldehyde. Up to about 1 per cent may be employed in fine lilac perfumes.

Phenyl-propyl Cinnamate has a powerful balsamic odour and occurs naturally in storax. It is a useful fixative.

Phixia, 100 per cent, is a name given to hydroxy-citronellal, of high boiling-point (*which see*).

Pimento Oil is a fragrant liquid whose odour resembles that of clove with a suggestion of cubebs and nutmeg, and for this reason is known as **Allspice Oil.** It is obtained by distillation from the dried unripe fruit of *Pimenta officinalis*, N.O. Myrtaceæ, a plant native of the West Indies and found also in Central America. The oil contains eugenol, methyl-eugenol, cineol, caryophyllene, etc., the odour of the first-named constituent predominating. It is useful in bay rum, and is employed for modifying the odour of carnation oils.

Pimpinella Anisum—*see* Aniseed Oil.

Pine Needle Oils are distilled from the needles and cones of several species of the N.O. Coniferæ. The variety of most interest to the perfumer is that obtained from the leaves of *Abies sibirica* and known in the drug trade as Siberian "Pine" oil. This oil is distilled principally in North-East Russia and possesses a fragrant and refreshing odour of pine trees. It is useful in preparing pine bath crystals and aromatic sprays for theatres and cinemas, etc. It contains a very high percentage of bornyl acetate (*which see*).

Piperonal is Heliotropin.

Piperonal-vanillone is a new chemical body obtained by the condensation of heliotropin and vanillin. It is also known as amorphous heliotropin and is very useful in preparing heliotrope perfumes, replacing the familiar body to advantage. Some makes are nothing more nor less than a mixture of powdered heliotropin and powdered vanillin.

Pomades—*see* Enfleurage.

Portugal Oil—*see* Neroli.

Pigments.—The following list includes the more important colours used for tinting cosmetics and theatrical grease paints. For other tints reference should be made to dyestuffs :—

Black: *Animal Black* is obtained by carbonising all kinds of animal matter, including skin, horn, hoofs, etc.

Bone Black is supposed to be made from bones only.

Carbon Black is made by heating wood in closed retorts to a high temperature, the resulting mass being ground and washed.

Charcoal Black is carbon black.

Drop Black is prepared like Frankfurt black, but the ground product is mixed with glue water and sent into commerce in the form of tears.

Frankfurt Black is prepared by heating bones, vine twigs, etc., in closed retorts at high temperature, the resulting mass being pulverised and washed.

India Ink is probably lamp black moulded with glue or size and perfumed with musk, patchouli, etc. It may contain sepia.

Ivory Black prepared from ivory cuttings is a rare product owing to cost of raw materials.

Lamp Black is prepared from heavy oils by ignition and collection of the soot. It contains a high proportion of pure carbon.

Blue: *Antwerp Blue* is prepared by dissolving ferrous sulphate, zinc sulphate, and alum in water and adding a solution of potassium ferrocyanide.

Berlin Blue is a cheap form of Chinese blue.

Blue Verditer is a basic carbonate of copper.

Bremen Blue is obtained by mixing copper carbonate with an excess of copper hydroxide.

Brunswick Blue is made by adding barytes to Prussian blue.

Chinese Blue is the name given to the finest quality Prussian blue, and is prepared by adding potassium ferrocyanide to a ferric salt in solution.

Cobalt Blue is obtained by heating to redness the precipitated oxides of cobalt and aluminium.

Lime Blue is made by adding milk of lime to a solution of copper sulphate and ammonium chloride.

Paste Blue is Prussian blue.

Prussian Blue is ferric ferrocyanide. It is made in a similar way to Chinese blue.

Ultramarine is obtained when a finely ground mixture of kaolin, sodium carbonate, sulphur, and charcoal are heated to redness.

Brown: *Burnt Sienna* is anhydrous oxide of iron with traces of manganese, etc. The tint varies according to the temperature and period of heating.

Burnt Umber resembles sienna in manufacture.

Cappagh Brown is mined in the district of Cork, Ireland, and is a mixture of the oxides of iron and manganese.

Vandyke Brown is an impure hydrated oxide of iron.

Green: *Chrome Green* is a mixture of chrome yellow, barytes, and Prussian blue.

Cobalt Green is prepared by heating to redness the precipitated oxides of cobalt and zinc.

Emerald Green is aceto-arsenite of copper and *should not be used.*

Malachite is a basic carbonate of copper.

New Brunswick Green is chrome green.

Paris Green is emerald green.

Rinmann's Green is cobalt green.

Schweinfurth Green is emerald green.

Zinc Green is cobalt green.

Red: *Armenian Bole* is an impure ferric oxide.

Carmine Lake is a compound of cochineal, lime, and alumina.

Chinese Red is prepared from lead chromate by warming with alkalis.

Chrome Red is similar to Chinese red.

Copper Chromate is brownish-red in colour.

Crimson Lakes contain a higher percentage of alumina than carmine lakes.

Crocus is ferric hydroxide.

Derby Red is a name for Chinese red.

Indian Red is anhydrous oxide of iron.

Madder Lake is obtained when the colouring matter from the root of *rubia tinctorum*, the madder plant, is precipitated by inorganic bodies.

Red Oxide is Indian red.

Rouge is anhydrous oxide of iron, Fe_2O_3.

Scarlet Lakes are crimson lakes tinted with vermilion.

Venetian Red is rouge of inferior quality.

Vermilion is mercury sulphide. It occurs naturally as the mineral *cinnabar*, but is manufactured artificially from metal mercury and sulphur. Three shades are obtainable, extra pale, pale, and deep.

Violet shades are produced by mixing any of the blues and reds in suitable proportions ; pale tints being obtained by the addition of zinc oxide.

White : *Zinc Oxide* is the best dead white ; it is known as *Zinc White* and *Chinese White*.

Barium Sulphate is also used ; it is known variously as *Permanent White* and *Barytes*.

Yellow and Orange : *Barium Chromate* is prepared from a soluble barium salt by the addition of potassium chromate.

Brilliant Yellow is a mixture of cadmium yellow and barytes or other basic white material.

Cadmium Yellow is cadmium sulphide.

Cassel Yellow is an oxychloride of lead.

Chrome Yellow is lead chromate.

Citron Yellow is zinc chromate.

King's Yellow is arsenic sulphide and *should not be used*.

Lemon Chrome is barium chromate.

Mineral Yellow is the same as Cassel yellow.

Montpelier Yellow is an oxychloride of lead.
Orange Chrome is a basic lead chromate.
Turner's Yellow is the same as Montpelier yellow.
Verona Yellow is cassel yellow.
Yellow Ultramarine is barium chromate.
Zinc Chrome is prepared by precipitation from solutions of its soluble salts with potassium chromate.

Quandong is the name given in Australia to the tree which yields South Australian sandalwood oil—*Fusanus acuminatus*, N.O. Santalaceæ.

Quassia is the wood of the trunk and branches of *Picræna excelsa*, N.O. Simarubaceæ, grown in Jamaica. An aqueous extract is useful in hair lotions.

Quercitron—The name given to the bark of *Quercus tinctoria* or *Q. discolor*, N.O. Cupuliferæ, imported from America, and used for dyeing. **Quercitrin** is a glucoside.

Quillaia is the inner part of the bark of *Quillaja saponaria*, N.O. Rosaceæ, grown in South America. It contains a body saponin (*which see*). The tincture (1 in 20 of 60 per cent alcohol) is used in liquid dentrifices for producing a froth or foam, when soap is undesirable.

Quince—The seeds of *Pyrus cydonia*, N.O. Rosaceæ, cultivated in Europe. They contain about 20 per cent of a mucilaginous principle called **Cydonin.** On this account they are useful as a basis of creams where tragacanth is not desirable.

Quinine is the most important alkaloid present in cinchona bark, and is believed to be useful in hair tonics. **Eau de Quinine**, a bright red preparation, was originated by Ed. Pinand, of Paris, and many have tried to imitate it. Quinine is also used in dentifrices.

Quino-Quino is the name given to a balsam resembling peru and tolu and obtained from *Myroxylon balsamum*, var. *punctatum*, N.O. Leguminosæ, a tree growing in Florida,

Bolivia, and Peru. It is used in the preparation of incense and as a varnish. Vanillin has been identified as a constituent.

R. signifies resinodor, gomodor, etc. The preparation of this type of body is described in the chapter on fixation. In the various formulæ it represents these products diluted with sufficient alcohol to make them pourable.

Radiol is a recently introduced condensed aldehyde of remarkable strength, which gives to soaps the same advantages as the higher aliphatic aldehydes give to perfumes. Ordinary perfumes are readily destroyed by lye-washes and odorous fats, but the fatty aldehydes, on the contrary, have odours which are much akin to and blend well with these fats. According to Floraine,[1] when radiol is used combined with the resinodors for soaps and more particularly with muscamber R., which is one of the strongest fixing agents on the market, it enables the soapmaker to obtain at a cheap price some remarkably strong perfumes which are more tenacious than anything else known. Thus a lilac perfume for 2 cwt. of soap is made as follows :—

Terpineol-linalol mixture . .	500 grams
Benzyl acetate	400 „
Bromstyrol	20 „
Radiol	30 „
Muscamber resinodor . . .	10 „

For mimosa, substitute paramethyl acetophenone for bromstyrol.

Randia is a genus of evergreen shrubs, natives of the East, and closely allied to the gardenia ; there are several species, many of them very fragrant.[2]

Reine des prés—*see* Meadow-sweet and Salicyl Aldehyde.

[1] "La Parfumerie Moderne" (1922), 214.

[2] For these see D. McDonald, "Fragrant Flowers and Leaves" (1895), 101.

Reseda—*see* Mignonette and monograph, Chap. III, Part II.

Reuniol is the name given to a mixture of geraniol and citronellol; it is used as a base for rose perfumes.

Rhodinol was the name given to an impure compound isolated from rose otto by Eckart in 1891. It is used to-day by some manufacturers as a description for a mixture of geraniol and citronellol, while others claim that it is a pure alcohol isomeric with geraniol and separated from oil of rose geranium. The odour value of the product differs with the source of supply, but the best and most expensive samples approximate more nearly to that of otto of rose than any other single perfume. It is suitable for all preparations of geranium and rose and is particularly useful in soaps. It is generally used in conjunction with phenyl ethyl alcohol and the esters of geraniol and citronellol. It is stated to be largely used for adulterating rose otto.

Rhodinyl Acetate is a colourless oil with a fresh rose-like odour. It is used for imparting a special note to artificial rose otto.

Rhodinyl Butyrate is a liquid having a very much softer note than the geranyl ester, and is indispensable for the moss rose of subtle odour.

Rhodinyl Formate has an odour recalling wild rose and is employed in perfumes of this type. It is also useful in carnation ottos. It is a colourless liquid.

Rhyuno Oil is distilled in Japan, and as it contains as much as 75 per cent of safrol, would appear to be of considerable commercial importance as a source for this product.

Rice Starch is obtained from *Oryza sativa*, N.O. Graminaceæ. The granules are extremely minute, nearly uniform in size, polygonal, and without evident hilum or

striæ. It is the basis of the finest quality face powders, "Poudres de Riz," and is used in preference to other starches on account of its comparative invisibility. (The larger sizes of the granules of other starches give a "floury" effect.)

Roccella—*see* Cudbear.

Rock Rose—*see* Labdanum.

Romneya Coulteri is an herbaceous perennial, bearing large white flowers like single peonies, with a delicate magnolia-like perfume. This flower is known as the *Californian poppy*.

Rondeletia—According to Sawer[1] this name was given by Plumier in memory of William Rondelet, a famous physician and natural historian, to an extensive West Indian and tropical American genus of the many-seeded division of *Cinchonaceæ*. Most of the species are shrubs, but a few grow to the size of trees, whose flowers are very fragrant. Perfumes sold under this name are not usually prepared from the natural flowers.

Rose Absolute is obtained from the flower in the south of France by means of volatile solvents and sometimes by extracting the pomade made by maceration. Its odour is quite different from that of the distilled otto and more accurately represents the fresh flower perfume. It is also much cheaper, being about one-third of the price of Bulgarian oil. A rose oil obtained from German flowers by extraction with volatile solvents has been examined by Elze[2] who records a yield of 0·015 per cent. He found that phenyl ethyl alcohol was the chief constituent, and in addition geraniol, citronellol, nerol, and farnesol were identified. For further details, reference should be made to the monograph.

[1] "Odorographia," second series (1894), 459.
[2] "Year Book of Pharmacy" (1920), 73.

Rose de Mai is obtained in the south of France by extracting the flower with volatile solvents. It recalls a mixture of jasmin and Bulgarian rose.

Roseine is a proprietary rose fixative for soaps.

Rosemary Oil is obtained by distillation of the flowering tops of *Rosmarinus officinalis*, N.O. Labiatæ, a plant indigenous to those parts of Europe bordering on the Mediterranean. The principal commercial oils are obtained from the south of France, Spain, and the Dalmatian Islands, but latterly Spanish competition has been so keen that French oils are no longer distilled in Provence.[1] Rosemary is distilled on a comparatively small scale in England, and this product is most esteemed; it is more expensive than the foreign oils. The character of these oils varies with the source and also with the parts of the plant distilled, the finest product being obtained from the dried leaves. The chief constituents of the oil are borneol, camphor, cineol, pinene, and camphene. Rosemary oil is liable to adulteration with turpentine and spike oil. It is used in cheap perfumery, hair washes, and soaps. English and French oils are employed for blending in eau-de-Cologne and give better results than other varieties. The terpeneless oil is four times concentrated.

Rosenöl is a synonym for rose otto.

Rose Oil is distilled principally in Bulgaria from a red rose, *Rosa damascena*, and to some extent from a white rose, *R. alba*. The latter is seldom distilled alone as the resulting oil would contain too much stearoptene. Other rose oils are met with in commerce, those from Anatolia and France being the most serious competitors. The former compares favourably with Bulgarian oil in odour, but the latter does not—it is, however, much cheaper. Attar of roses may be subjected to skilful and scientific adulteration, and among those bodies which may be em-

[1] Roure-Bertrand Fils, "Bulletin," October (1921), 94.

[*By the courtesy of Messrs. Stafford, Allen & Sons.*

FIG. 6.—Field of English Rosemary at Long Melford. [*To face page 124.*

ployed for this purpose are : rhodinol, geraniol, citronellol, etc. Artificial rose oils are now in common use and their price varies according to the amount of genuine otto they contain. It is believed to be impossible at present to accurately reproduce the odour from synthetics and natural isolates alone, and therefore the following formula must be taken only as a base, and for use should be backed up with 10 per cent of virgin oil :—

Geraniol	500 c.c.
Citronellol	170 „
Phenyl ethyl alcohol	200 „
Linalol	100 „
Rhodinyl acetate	25 „
Aldehyde C_9	5 „

Roseol is probably a mixture of geraniol and citronellol.

Rosewood Oil is obtained by distillation from the wood of *Convolvulus scoparius*, N.O. Convolvulaceæ, a plant grown in the Canary Islands. It is commonly called oil of **Rhodium**, but is very rarely found in commerce. In the drug trade oils bearing this description are frequently mixtures of geranium or palmarosa oil with sandalwood oil. The latter produces the viscosity characteristic of the true oil.

Rosindol is a white crystalline body melting at 88° C. It is of continental origin, and its constitution is at present a secret. It has a marked rose odour, and is an extraordinarily good fixative for this or any other sweet-smelling perfume. It is soluble in most essential oils and synthetics.

Rouges Synthetic are dyestuffs (*which see*) ; they may be either carmoisine, eosine, erythrosine, rose Bengal, phloxine, or ponceau.

Saffron, also known as Crocus, is the dried stigmas and tops of the styles of *Crocus sativus*, N.O. Iridaceæ, grown in Southern Europe, South-West Asia, and India. The chief constituent is crocin, a glucoside, easily soluble in

water and producing a yellow solution. Saffron was at one time much used as a colouring agent, but owing to its high price is now largely replaced by the dyestuff, tartrazine yellow. **Saffron Oil** is a limpid liquid with a slightly yellow tint and possessing an intense odour of saffron, which, although exceedingly rich and of a somewhat culinary tone, is comparable to the fatty aldehydes. Its price is almost prohibitive, but only traces are required to produce original bouquets ; and it is particularly applicable to the oriental type of perfume.

Safrole occurs naturally in the oils of sassafras and camphor. At normal temperatures it is a colourless liquid with an agreeable odour ; at lower temperatures it is a white crystalline solid and melts about 10° to 11° C. Safrole is used as a cheap perfume and very largely in soap. It is used as the starting-point in the synthesis of heliotropin (*which see*).

Salicylic Acid is a white crystalline body melting at 156° C. (some samples are greyish-white owing to impurities present). It is prepared by heating sodium phenate, under pressure, with carbon dioxide. Salicylic acid has remarkable preservative qualities, and on this account is valuable in certain toilet preparations.

Salicylic Aldehyde is an aromatic liquid with an odour recalling that of meadow-sweet. It has been found in several essential oils, notably that distilled from *Spiræa ulmaria*, and other species of the N.O. Rosaceæ. It may be prepared artificially and is the starting-point in the synthesis of **Coumarin** (*which see*). Salicyl-aldehyde is employed in compounding violet and fancy bouquets.

Salvia Sclarea.—Clary sage or muscatel sage is a native of Southern France, Italy, and Northern Africa, and the plant, which is xerophilous, belongs to the natural order Labiatæ. It is stated to have been introduced into English cultivation in the year 1562, and was for some time a popular medicine, being mostly employed in disordered states of digestion. The name "clary" comes from the Latin *Sclarea*, a word

[*Vivax.*

FIG. 7.—Cultivation of Clary Sage. First attempt at Lorgues (Var.) in 1920.

[*Vivax.*

FIG. 8.—Clary Sage—cultivation extended under the Olives. M. le Commandant Gros in the background.

[*To face page* 127.

derived from *clarus*, clear. This was often popularly modified into "clear eye," from the fact that a decoction of the seeds placed in the eye would "clear" it of any foreign body. On this account it was even called "see bright" and "eye-bright." The herb was first employed commercially by the wine merchants of Germany, who infused it with elder flowers, and then added this liquid to the Rhenish wines, which were thereby converted into "muscatels." The plant is still known in Germany as *Muskateller sallier* (muscatel sage). Clary sage has been cultivated in the Piedmont district of Italy since 1908, the powdered flowers being used in the manufacture of various brands of vermouth, associated with the town of Turin, to which they impart the peculiar flavour resembling that of muscatel raisins. It is this aroma which is so distinctive in fine quality essential oils, such as certain varieties of geranium and neroli, and which is absent in synthetic aromatic chemicals, as instanced by geraniol and nerol (in comparison). It is to M. Gattefossé that we are indebted for the introduction of this valuable plant as a perfume. In 1909, in collaboration with M. Mus, he undertook the cultivation of clary sage in the department of Varclause in France, and in the first year, the essential oil obtained from the herb was made use of by a few of the leading Parisian perfumers. During recent years M. Gattefossé has experimented widely in the cultivation of clary sage, and he states[1] that the methods employed in growing and gathering the plant appear to materially influence the physical character of the essential oil obtained. The use of manure, generally known as increasing the quantity of the flowers (at the expense of the leaves) is important and favourable. The maturity of the seeds, the hour of collection, and the more or less dry state of the plant, make the principal characters vary between very wide limits. They are cultivated *without irrigation*, principally under the olives (*see* Fig. 8) and on stony hills.

[1] "La Parfumerie Moderne" (1922), 59.

There are several kinds of **Clary Sage Oil**, and the distillation of the whole plant, as made in many districts, is prejudicial to the excellence of the product. The leaves yield a small quantity of oil, but only the inflorescences produce the real odour of the muscatel grape. Two distinct varieties of oil are met with in commerce; one is a colourless to pale yellow liquid, distilled from the flowers only, while the other is a viscous greenish liquid, presumably distilled from the whole herb, and possibly after it has fermented slightly, or more probably extracted from the plant by means of volatile solvents. This kind would appear to contain a proportion of resins and oxygenated bodies of a strong odour, which precludes its use in perfumes "de luxe." It is known as "oil of amber" or "vegetable amber," and is well adapted for use as a fixing agent. The colourless oil possesses an odour of finer fragrance, recalling a mixture of ambergris, neroli, and lavender, and in a few years will probably be valued even more than rose otto is to-day. It is an indispensable constituent of ambers, chypre, carnation, trèfle, foin coupé, and orchidée, while most artificial perfumes are much improved when a small quantity is added to them. It materially assists in suppressing their harshness, but at least a month must elapse before this becomes evident. Perhaps the most valuable application of genuine clary sage oil, however, is in eau-de-Cologne, to which it imparts a mellowness, sweetness, and persistence which is unobtainable even with ambergris. The composition of this product is related to bergamot oil by reason of its high linalyl acetate content, and to lavender by its odour of muscatel, which makes its use imperative in the finest eau-de-Cologne and lavender waters. Further, it is the only product capable of improving the odour of artificial musk, and in this connection it is interesting to note that M. Gattefossé has succeeded in producing a hybrid, to which the name of *Salvia turquestiana* has been given, and which is being grown in the plantations at Fontescalières, near Nîmes. Although this variety yields less essential oil, its perfume has a slightly

[*S.F.P.A.*

FIG. 9.—1922 Cultures of Clary Sage at Montbrisson (Loire).

[*To face page* 128.

higher musk odour. The high price of the oil of clary sage is explained by the fact that the yield is only about 0·1 per cent. An example is appended of the use of this oil in artificial amber :—

Musk extract soluble 10 per cent .	350 c.c.
Civet „ „ „ „ .	200 „
Castor „ „ „ „ .	100 „
Clary sage oil	50 „
Jasmin, concrete	25 grams
Labdanum R.	25 „
Vanillin	50 „
Benzoin R.	200 „

Sambucus—*see* Elder Flowers.

Sandalwood Oil is distilled principally from the wood of *Santalum album*, N.O. Santalaceæ, a tree indigenous to the mountainous districts of India. It grows in abundance at elevations up to 3000 feet above sea level, and attains a height of 20 to 30 feet. The cultivation of the tree is a government monopoly, and the chief centre is Mysore. In November and December the supplies of wood are sold by public auction and exported to Europe, China, etc., from Bombay, Mangalore, and other ports. Sandalwood is also obtained in Java, and this variety enters commerce via Macassar, hence the name "macassar sandalwood." The best grades of wood are used in Kanora, India, for the artistic carving of idols, etc. ; some is employed as incense, but the major portion, however, is used for distillation. Sandalwood yields about 4 per cent of essential oil, which is a rather viscid, pale yellowish liquid, possessing a peculiar, faint, but very persistent odour. The specific gravity is about 0·975, and it contains upwards of 90 per cent of **Santalol**, which is regarded as a mixture of two alcohols. The finest oils are distilled in Europe, and owing to the use of more modern apparatus, as much as 6 per cent yield has been recorded. The usual adulterants of this product are castor oil and cedarwood oil.

Sandalwood oil plays a considerable rôle in medicine as

well as in perfumery, and owing to its marked fixative properties, is one of the most important constituents of Eastern perfumes. It is also much employed in violet, cassie, and reseda compositions, and will blend well with heliotropin, coumarin, musk, and floranal.

It should be noted that West Indian and West Australian sandalwood oils are obtained from quite different botanical sources; the former from *Amyris balsamifera*, N.O. Burseraceæ, and the latter from *Fusanus spicatus*, N.O. Santalaceæ.

Santalol—*see under* Sandalwood Oil.

Saponin is a body occurring in quillaia bark, and is a mixture of two glucosides, *quillaic acid* and *quillaia-sapotoxin*. These are similar to the *polygalic acid* and *senegin* of senega root. Saponin is violently sternutatory, and will immediately produce a foam when shaken with water. It is very useful for emulsifying oils and fats, and on this account traces are employed in the preparation of so-called toilet milks. Its use in place of soap for making dental preparations foam is not recommended, as it leaves behind in the mouth a distinct bitterness.

Sassafras Oil is obtained by distillation of the root of *Sassafras officinale*, N.O. Lauraceæ, a plant indigenous to North America. The inner root bark as well as the wood is used for distillation, and the yield of oil from the latter is about 2 per cent, while the former often contains as much as 8 per cent. This oil contains 80 per cent of **Safrole** (*which see*), and is used as a cheap perfume for soap.

Schœnanthe is a synonym for oil of lemon grass.

Serpolet is a wild thyme (*which see*).

Shikomol is the name given to a body which is identical with Safrole.

Shiu Oil is distilled in Japan from a plant belonging to the N.O. Lauraceæ, and is offered as a substitute for linaloe

oil. It contains from 50 to 65 per cent of linalol in the free state, and also pinene and camphene. It has recently entered commerce as a source of linalol and its esters.

Sighala Oil is a crude form of Storax.

Skatol is a crystalline substance melting at 95° C., possessing a most disagreeable odour, and has been identified as a constituent of civet. Like this body, its odour in dilute solutions is pleasant, and it is occasionally used instead of civet for fixing floral ottos. Chemically it is related to **Indol** (*which see*), and is the β-methyl ester.

Son Sanate Balsam—*see* Balsamo Blanco.

Souchet is a French name applied to the dried tuberous roots of several species of *Cyperus*, which on account of their aromatic properties are used as perfumes.

Spearmint Oil is distilled from the fresh flowering spearmint, *Mentha viridis*, and other species of the N.O. Labiatæ, grown in England, America, Russia, Germany, etc. **Carvone** is the principal constituent, and occurs up to 50 per cent in some oils. It is useful as a flavouring agent in dental preparations, and is largely employed in the manufacture of chewing-gum in the States.

Spermaceti—*see* Cetaceum.

Spicewood Oil is obtained from the bush *Laurus benzoin*, N.O. Lauraceæ, grown in North America, and known in Canada as "Spice Bush." It possesses a fragrant smell, and methyl salicylate has been identified as a constituent. It is also known as wild allspice, and is useful in bouquets containing lavender, where a spicy note is desired.

Spike Oil—*see* under Lavender.

Spikenard Oil is distilled from the root of *Nardostachys Jatamansi*, N.O. Valerianaceæ, a perennial herb, closely allied to the common valerian. It is a native of Nepal, Bhotan, and other parts of the Himalayan Mountains,

and in India its roots are highly prized as a perfume for the hair. The oil is pale yellow in colour, with an odour reminding of musk (faintly), patchouli, and valerian. It is practically unobtainable at present, and is sometimes replaced by the oil distilled from *Valeriana officinalis*, or by the valerianic acid esters of citronellol and rhodinol.

Spiræa Ulmaria is the Meadow-sweet (*which see*).

Starch—The three varieties of most interest to the manufacturer of cosmetics are the following :—

Maize starch from *Zea mays*, N.O. Graminaceæ.

Arrowroot from the rhizome of *Maranta arundinacea*, N.O. Marantaceæ.

Rice starch from *Oryza sativa*, N.O. Graminaceæ.

The first is largely employed as the base of violet powders, and dusting powders. The second, finely sifted and tinted, is sold as theatrical face powder. The third either alone or mixed with zinc stearate, etc., is an indispensable constituent of the finest "Poudre des Riz." It should be noted that potato starch is not much used in these products as the grains are so large and in consequence too visible to the eye.

Stavesacre Seeds are the dried ripe seeds of *Delphinium Staphisagria*, N.O. Ranunculaceæ, cultivated in Southern Europe and Asia Minor. In the form of a lotion or ointment they are useful for the destruction of pediculi.

Stearic Acid is obtained from tallow and other fats by saponification with lime or magnesia, in the presence of steam at high pressure, the stearate being subsequently treated with acid and purified. Several varieties are met with in commerce, and their melting-points vary according to purity. Stearic acid is the base used in preparing modern vanishing creams, and for this purpose should be a white crystalline inodorous solid, melting about 56° C. The fatty acid is melted, and partially saponified by treatment

with a hot alkaline solution. The cream is stirred until cold, and then suitably perfumed—*see* Skin Creams, Part III.

Stephanotis, or creeping tuberose, as it is sometimes called, is *Stephanotis floribunda*, N.O. Asclepiadaceæ, a plant native to Madagascar. It is grown in greenhouses for its delightfully fragrant and beautiful white flowers, few equalling these in their wax-like purity. Stephanotis perfumes are usually mixtures of synthetics, with a liberal addition of natural tuberose. The following formula will show the lines on which this odour may be imitated :—

Rhodinyl acetate	400 c.c.
Iso-eugenol	10 „
Coumarin	50 grams
Heliotropin	200 „
Ionone	40 c.c.
Orris oil, concrete . . .	20 grams
Musk ambrette	20 „
Cassie absolute	80 c.c.
Jasmin synthetic	80 „
Tuberose, concrete soluble . .	100 grams

Stock—Night-scented stock is the delightfully odorous *Matthiola tristis*, N.O. Cruciferæ. The perfume is imitated by a mixture of linalol, iso-eugenol (traces), coumarin, hydroxy-citronellal, and nonyl aldehyde : the most suitable fixative being balsam of Peru.

Storax is a balsam obtained by bruising the bark of *Liquidambar orientalis*, N.O. Hamamelaceæ, a tree native of Asia Minor. It cannot be used in the crude state, and is purified by dissolving it in alcohol, the solution being filtered and the solvent subsequently distilled off. It is a brownish-yellow oleo-resinous balsam with a strong hyacinth-like odour, and contains about 1 per cent of essential oil together with resin, etc. Styrol and several esters of cinnamic acid have been identified together with traces of vanillin. Storax is a valuable fixative, and may be employed in the following perfumes : hawthorn, cassie, corylopsis, wild rose, wallflower, lavender, magnolia, and verbena. It

is particularly useful in synthetic hyacinths, narcissus, and jonquille.

Liquid Storax of American origin is found in slight excrescences on the bark of the tree, *Liquidambar styraciflua*, occurring in vast forests high up in the mountains of Honduras. It is a viscous, transparent liquid having an aromatic balsamic odour, and was at one time exported to Spain from Mexico for perfumery purposes. At present it is not much used.

Strawberry Aldehyde is Hexadecyl Aldehyde C_{16} (*which see*).

Styracin is Cinnamyl Cinnamate (*which see*).

Styrol (Styrolene) is a fragrant liquid, having an odour slightly recalling that of naphthalene. It may be prepared artificially, and has been identified as a constituent of several natural balsamic exudations, notably storax. It is a useful fixative for the hyacinth-type of perfume.

Styrolene Acetate is a colourless liquid with a subtle odour recalling a bouquet of hyacinths and jasmins. It is extremely useful for producing a suggestion of hyacinth in other perfumes, such as cyclamen, and can be used up to 10 per cent in this synthetic floral oil. It is employed in other perfumes to round off the bouquet, but in these cases 5 per cent is rarely exceeded.

Styrolene Propionate resembles the acetate in general character, but it is more useful in narcissus and jonquille perfumes.

Styrolene Valerianate is an oil with a less delicate odour than either the acetate or propionate. It may be used in the above-mentioned perfumes.

Styrone, or styrolene alcohol, is Cinnamic Alcohol (*which see*).

Suet is the internal fat of the abdomen of the sheep, *Ovis aries*, purified by melting and straining. It contains

70 per cent of stearin and palmatin, and about 30 per cent of olein. It is sometimes used as the fat base of cheap grease paints (*which see*).

Sumbul Root yields about 0·5 per cent of an essential oil, having a musky smell. The plant, *Ferula sumbul*, N.O. Umbelliferæ, is grown in India, and also Russia and Turkestan, where it is known as jatamansi and musk root. The oil is difficult to obtain, but a strong tincture, 1 in 5, in 90 per cent alcohol will replace it, and the resin (about 6 per cent) extracted will at the same time make an excellent fixative for oriental bouquets.

Surea—*see* Elder-flower Oil.

Sweet Pea is the popular name for *Lathyrus odoratus*, a plant belonging to the N.O. Leguminosæ. It is a native of the Island of Sicily, and is now largely cultivated in our gardens for its elegant flowers of delicate and sweet fragrance. The odour of sweet peas recalls that of orange blossom with just a suggestion of rose. All synthetic imitations have as their base benzylidene acetone, and in dilute solutions this body bears a marked resemblance to the odour of the flower, especially if suitably backed with orange blossom, rose, and jasmin. The bouquet is improved by the inclusion of phenylacetic aldehyde, and may be fixed with tolu or mastic. The synthetic otto is made on the following lines :—

Benzylidene acetone	50 grams
Piperonal-vanillone	50 „
Musk ketone	10 „
Phenylacetic aldehyde	200 c.c.
Terpineol	330 „
Hydroxy-citronellal	50 „
Bergamot oil, terpeneless	100 „
Iso-butyl phenylacetate	40 „
Orange blossom, absolute	50 „
Rose absolute	30 „
Jasmin absolute	20 „
Tolu balsam	50 „
Methyl nonyl ketone	2 „
Nonyl alcohol	18 „

Sylvanol is a crystalline body melting from 38° to 68° C., and is evidently a mixture, probably containing a derivative of coumarin. It possesses exceptional fixative properties, and is of considerable value on account of its solubility in water.

Syringa.—The mock orange, *Philadelphus coronarius*, N.O. Saxifragaceæ, is commonly called "Syringa." This plant, however, has no right to the title as it is the botanical name for common lilac, *Syringa vulgare*, N.O. Oleaceæ. Mock orange perfumes are seldom obtained from the flower, but are more frequently mixtures of synthetic muguet and neroli, as the following formula will illustrate :—

Terpineol	250 c.c.	
Linalol	150 „	
Hydroxy-citronellal	100 „	
Iso-butyl benzoate	50 „	
Methyl anthranilate	50 „	(melted)
Benzyl formate	30 „	
Linalyl acetate	70 „	
Phenyl ethyl alcohol	150 „	
Vanillin	40 grams	
Indol	5 „	
Decylic aldehyde	5 c.c.	
Benzoin R.	100 „	

Talc is a hydrated silicate of magnesium with a soapy feel. The finest qualities (usually Italian) are white in colour, while inferior grades are greyish. In powder form it is largely used in toilet powders, and is sold with or without admixture, but well perfumed, as *Talcum Powder* (*which see*).

Tangerine Oil is known in commerce as mandarin oil (*which see*).

Tansy Oil is obtained by the distillation of the leaves and tops of *Tanacetum vulgare*, N.O. Compositæ, a herb found in the United States and Europe. Its principal use is in medicine.

Tarragon Oil is obtained by distillation from *Artemisia Dracunculus*, N.O. Compositæ, and is generally considered to be of culinary value only. In perfumery, however, it may be used up to 0·5 per cent for obtaining special effects in fancy bouquets, and also the fern and new-mown hay type of otto. An example of its use is appended :—

Coumarin	300 grams
Heliotropin	200 „
Rose absolute	60 c.c.
Methyl acetophenone	5 „
Cassie absolute	25 „
Rhodinol	110 „
Di-methyl hydroquinone	100 grams
Benzyl iso-eugenol	50 „
Civet extract soluble 10 per cent	20 c.c.
Tarragon oil	10 „
Benzoin R.	120 „

Terebene is a colourless and odorous liquid made by treating oil of turpentine with sulphuric acid, and is used in medicated soaps.

Terpeneless Oils possess many advantages over the ordinary essential oils of commerce, and as a group are one of our most useful perfume raw materials. They are the result of researches made during recent years into the constitution of volatile oils, and have led, in many cases, to the proper evaluation of the several constituents and to the manufacture of concentrated oils described as "terpeneless," "sesqui-terpeneless," etc.

The removal of the non-oxygenated constituents consisting of hydrocarbons, terpenes, and resins, etc., is generally effected by fractional distillation *in vacuo*, and if this process is carefully controlled, the odour of the resulting concentrated oil is not impaired. Unfortunately, however, there is an enormous difference in the makes of terpeneless oils—bergamot, for example, and although it is possible that the raw material may have something to do with this, it is feared that in the majority of cases the imperfections are

due to careless manipulation during manufacture. The terpene residues, which are considerable from *Citrus oils*, are cheap, and while some find their way into the soap industry, a large proportion is probably sold for the adulteration of natural oils.

A good terpeneless oil consists of the odoriferous

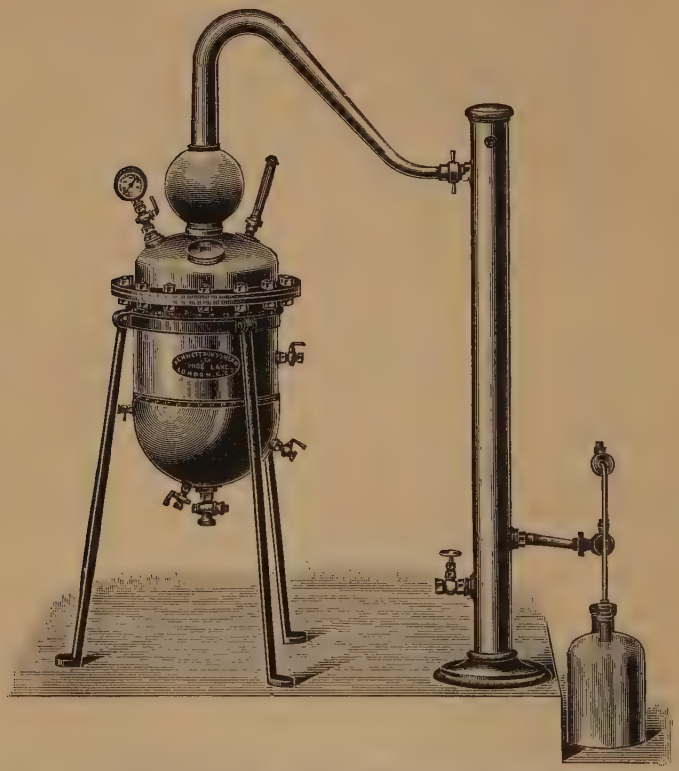


Fig. 10.—Vacuum apparatus used in the preparation of Concentrated Oils.

ingredients only, and in the case of lime oil, for example, this would not only include the citral, but all those other traces of unknown constituents which contribute so largely to the characteristic odour of the natural oil. Terpeneless oils, therefore, should not be confused with synthetics or even natural isolates, for who would say that citral from *Lemon-*

grass oil possesses so delicate and sweet an odour as terpeneless limetta oil, or that geraniol from *Palmarosa oil* is so fragrant as concentrated geranium oil, which not only contains geraniol but also citronellol with both their esters? This confusion has probably arisen through the comparison of such examples as anethol with terpeneless aniseed oil, and linalol with terpeneless bois de rose oil, but these instances are rare. Terpeneless oils always have more "body" than synthetics, and their preferential use is strongly recommended. To illustrate this point, better results are obtained from the employment of virgin rose otto mixed with terpeneless French geranium oil than from the same otto diluted with geraniol.

Furthermore, terpeneless oils possess two distinct advantages over the original oil in that they are (*a*) much more soluble in *dilute* alcohol, and (*b*) do not so readily decompose with age.

The first is really of most importance to-day since the duty on spirit is prohibitive. The natural oil, when added to dilute alcohol, always becomes turbid, due to the precipitation of the insoluble terpenes, and while the clarification of such a solution takes time, there is also a loss due to evaporation of the solvent. By experiment and after reference to the appended table of concentrations, it will be easy to arrive at the exact amount of terpeneless oil that can be used to replace the usual quantity of the natural one. The final product will not then require to be filtered, and in all probability a still further dilution of the alcohol will be possible with a proportionate and considerable saving. Several examples illustrating this advantage will be found under the chapter on Toilet Waters.

Different manufacturers give varying concentrations for their oils, and the following list has been compiled after due consideration of the maximum and minimum figures given :—

Table of Terpeneless Oils.

Showing their Solubility in Alcohol and Comparative Strength with the Natural Oil.

	Approximate Concentration.	Solubility in Alcohol.
Angelica	20	1 in 1—80 per cent.
Anise	1½	1 in 1—90 „
Aspic	2	.....
Backhousia	2	.....
Basil	2½	.....
Bay	3	1 in 2—70 „
Bergamot	3	1 in 1—80 „
Bois de Rose	2	.....
Calamus	8	.....
Cananga	3	1 in 1—95 „
Canella	2	1 in 2—70 „
Caraway	2½	„ „ „
Cardamons	2	1 in 2—75 „
Cassia	2	.....
Cedrat	30	.....
Celery	8	1 in 2—85 „
Cinnamon	2	1 in 2—70 „
Citronella (Ceylon)	2	„ „ „
„ (Java)	2½	„ „ „
Cloves	1½	„ „ „
Coriander	4	1 in 3—65 „
Cubeb	2	.....
Cummin	4	1 in 3—75 „
Curcuma	2	.....
Cypress	20	.....
Dill	2½	1 in 2—75 „
Eucalyptus	2	„ „ „
Fennel	2	.....
Galangal	3	.....
Geranium	2	1 in 3—70 „
Ginger	8	1 in 1—90 „
Ginger-grass	2	.....
Hops	8	.....
Hyssop	2	.....
Juniper Berries	10	1 in 1—90 „
Laurel	4	1 in 3—65 „
Lavender	2½	1 in 3—75 „

	Approximate Concentration.	Solubility in Alcohol.
Lemon	16	1 in 1—80 per cent.
Lemon-grass	2	1 in 3—75 ,,
Limes	15	1 in 1—80 ,,
Linaloe (Mexican)	2	.....
Mace	4	.....
Mandarin	70	1 in 1—80 ,,
Marjoram (Sweet)	2	.....
Melissa	5	.....
Myrtle	2	.....
Neroli	3	1 in 3—70 ,,
Nutmeg	6	1 in 2—80 ,,
Orange	40	1 in 3—75 ,,
Origanum	3	.....
Palmarosa	2	.....
Patchouli	2	.....
Peppermint	2	1 in 3—75 ,,
Petitgrain	2	1 in 1—80 ,,
Pimento	2	1 in 2—70 ,,
Rosemary	4	,, ,, ,,
Rose (Stearopteneless)	1½	1 in 1—70 ,,
Rue	2	.....
Sage	3	1 in 2—75 ,,
Salvia Sclarea	2	.....
Santal	2	.....
Sassafras	2	1 in 1—90 ,,
Spearmint	3	1 in 2—75 ,,
Tansy	2	.....
Thyme (Algerian)	2	.....
,, (French)	5	.....
Verbena	2	.....
Vetivert	3	.....
Wormwood	3	.....
Ylang Ylang	4	.....

Terpineol occurs naturally in several essential oils, including those of linaloe, petitgrain, and neroli. It is prepared artificially on a large scale and may be obtained from turpentine. This is first converted into terpin hydrate, which after recrystallisation from strong alcohol is boiled with dilute mineral acid. Commercial samples probably consist of alpha-terpineol together with other isomers. This

alcohol is much used in perfumery as the basis of the lilac type of perfume, while owing to its extraordinary stability it is largely employed in the soap industry. It blends well with almost any synthetic and particularly with hydroxy-citronellal, linalol, and ylang ylang oil. Its employment as a base for *Lilac* is illustrated by the following formula :—

Terpineol	450 c.c.
Piperonal-vanillone	50 grams
Hydroxy-citronellal	200 c.c.
Ylang ylang oil	25 „
Phenyl ethyl acetate	50 „
Benzyl propionate	100 „
Musk ambrette	25 grams
Benzoin R.	100 „

Terpinyl Acetate is a colourless liquid having a faint odour not unlike a mixture of bergamot and lavender. It may be prepared artificially by heating together terpineol and acetic anhydride. It is used as an adulterant for lavender oil.

Terpinyl Butyrate has been found in the oil of mountain pine (N. S. Wales). It may be prepared synthetically and is a liquid of characteristic odour. It is useful in fancy bouquets.

Terpinyl Cinnamate is a liquid with a fragrant and persistent odour. It is useful in the preparation of new-mown hay, and also in combination with rose and bergamot as the basis of "ideal" perfumes.

Terpinyl Formate is a liquid with a pleasant, rather fresh smell resembling citronellyl formate. It may be synthetically prepared, and is useful in the compounding of pseudo-nerolis.

Terpinyl Propionate is a liquid whose odour approximates more nearly to that of French lavender than any of the other esters. With an equal volume of bergamot oil it is invaluable for the perfuming of cheap lavender bath crystals—especially if fixed with oleo-resin orris.

Tetradecyl Aldehyde, or peach aldehyde (C_{14}) as it is sometimes called, has probably the most powerful odour of the whole series of aliphatic aldehydes. Mere traces of it, added to other floral bouquets, will give to them a note which is practically inimitable. It is also useful in larger proportions for giving distinction to any Eastern perfume. Commercial aldehyde, C_{14}, is stated to be a mixture which owes its peach note to a lactone.

Tetrahydroparamethyl Quinoline is a yellow liquid having an odour reminding of civet. It is sometimes called *synthetic civet* and bears a close resemblance to the 10 per cent·soluble natural extract.

Thuja-leaf Oil, sometimes called white cedar oil, is a colourless or greenish-yellow liquid of camphor-like odour. It is obtained from the leaves and twigs of *Thuja occidentalis* (or *Abor vitæ*), N.O. Coniferæ, and possesses useful fixative properties.

Thus—*see under* Olibanum.

Thyme-muscat Oil has recently been offered as a substitute for clary sage, but comparison is odious.

Thymene is obtained as a by-product in the isolation of thymol, and is used as a soap perfume. It is a mixture of hydrocarbons, consisting principally of cymene.

Thyme Oil occurs in the drug trade in two forms, "red" and "white," the former owing its colour to the imperfect distilling apparatus used during its manufacture. It is obtained from the leaves (sometimes the whole herb) of *Thymus vulgaris* or *T. zygis*, N.O. Labiatæ, a plant grown in Europe and northern Africa. French oils are considered the finest, and the "white" is merely the "red" which has been rectified in stills having condensers of tinned copper. Both French and Spanish oils contain thymol and in some cases carvacrol. The latter oil generally exhibits a higher phenol content. The former is occasionally used

with other oils for flavouring dentifrices and sometimes in cheap eau-de-Cologne.

Thymol is iso-propyl-meta-cresol, and occurs naturally in oil of thyme. It is a white crystalline solid, melting about 51° C., and liquefies when triturated with menthol, camphor, etc. It has a wide application in the manufacture of tooth powders, where traces only are necessary, and is considered by dentists as one of the finest antiseptics known.

Tilam Wangi is the name given to patchouli in the Straits Settlements.

Tilleul, or linden tree, *Tilia Europæa*, belongs to the lime tree family (Tiliaceæ), and is found wild in southern Europe and northern Asia. It is frequently cultivated for ornamental purposes, and its flowers are particularly fragrant. The perfume is imitated by mixtures of geraniol, linalol, methyl anthranilate, and benzyl acetate, fixed with musk ketone, benzoin, or Peru balsam.

Tonka "Beans" are the seeds of *Dipteryx oppositifolia* and *D. odorata*, N.O. Leguminosæ, grown respectively in Brazil and Guiana. They are distinctly aromatic and contain coumarin (about 3 per cent), which is also found in melilot. The two kinds are known in commerce as "Angostura" and "Para," the former being larger and more expensive. They are occasionally used in perfumery, but their place has been taken to a large extent by synthetic coumarin (*which see*).

Tonquinol is prepared by allowing nitric acid to act upon the sulphonic acids of butyl xylene. It is a sweet-smelling white powder, but does not appear to be much used. It is recommended as a fixative.

Tragacanth is a gum, exuded after incision of the stems of *Astragalus gummifer*, N.O. Leguminosæ, a shrub growing in Asia Minor. It occurs in commerce as flakes or tears, and is miscible with alcohol, but in water swells to a gelatin-

[*Roure-Bertrand Fils.*

FIG. 11.—Gathering Tuberoses.

[*To face page* 145.

ous mass. It is the basis of greaseless hair creams and many of the so-called benzoin creams for the hands. Owing to its highly tenacious mucilage it is valuable in the preparation of several other cosmetics.

Tredecyl Aldehyde (C_{13}) is a body with an intensely powerful odour of nondescript type. In general properties it resembles aldehyde, C_{14}.

Trèfle.—There are many varieties of clover, *Trifolium pratense*, N.O. Leguminosæ, the two most fragrant species being *Trifolium incarnatum* and *T. odoratum*. The former is common in England, while the latter, which possesses a delightfully sweet odour, is an Italian variety. Amyl salicylate, iso-butyl salicylate, or a mixture of methyl salicylate and vanillin, recall the odour of trèfle, and are extensively employed as the basis of this perfume. They are blended with ylang ylang, clary sage, and oakmoss resin and fixed with either musk ambrette or benzyl iso-eugenol. Distinct notes can be obtained by the use of benzylidene acetone and linalyl acetate. For further details and formulæ reference should be made to the monograph on Orchids and Trèfle.

Triacetin, or glyceryl acetate, is used as a solvent and fixative.

Tuberic Alcohol is a body isolated by Verley and recommended for shading the perfumes of violet, lilac, and muguet. It is a sweet-smelling, pale yellow oil.

Tuberose, *Polianthes tuberosa*, N.O. Amaryllidaceæ, is cultivated in the south of France, the crop being collected during August, September, and October. The perfume of the flowers is obtained by cold enfleurage or by extraction with volatile solvents, the former method giving a higher yield. The following bodies have been identified in the essential oil: methyl benzoate, methyl anthranilate, benzyl benzoate, methyl salicylate, and benzoic acid, together with a ketone named **Tuberone.** For further details and formulæ reference should be made to the monograph.

Tulip is a bulbous plant, *Tulipa Gesneriana* and other species of the N.O. Liliaceæ. It is said to be a native of the Levant, and appears to have been cultivated in England about 1577. The original or wild plants, probably *Tulipa sylvestris*, have yellow flowers, but cultivation has produced numerous beautiful varieties, varying largely both in colour and size. In the early part of the seventeenth century some of these varieties were so famous that high prices were paid for the bulbs, which in Holland became a speculative mania, known as "tulipomania." It is said that one bulb fetched as much as 4200 guilders, but this ruinous traffic was ultimately stopped by the State. For many years tulips have been favourite objects of cultivation and competition among florists in this country, and a very large business is still done by firms in Holland. The only variety of this genus which possesses any marked odour is the "sweet tulip," *Tulipa suaveolens*. It flowers during March and April, and its odour recalls Maréchal Niel rose. Tulip perfumes are not in much favour and are seldom compounded. The following formula will give some idea of their composition :—

Rose synthetic extra	520 c.c.
Jasmin synthetic	200 „
Linalol	100 „
Ionone, alpha	50 „
Petitgrain oil, terpeneless (French)	50 „
Methyl anthranilate	25 c.c. (melted)
Orris oil, concrete	20 grams
Ethyl salicylate	25 c.c.
Iso-butyl acetate	8 „
Benzaldehyde	2 „

Turmeric Oil is obtained from the rhizomes of *Curcuma longa*, N.O. Zingiberaceæ, grown in the East Indies, Cochin China, etc. It is a viscous yellow liquid with a characteristic odour.

Undecylic Alcohol occurs naturally in Algerian oil of rue and is now synthetically prepared. It is a liquid with

an odour of nondescript type, and resembles aldehyde C_{10} in general properties.

Undecylic Aldehyde is a liquid at normal temperatures with a powerful, indescribable odour. It is useful in traces for modifying floral ottos. This aldehyde, chemically, belongs to the unsaturated series.

Valerian Oil is distilled from the erect rhizome and roots of *Valeriana officinalis*, N.O. Valerianaceæ, a plant cultivated in Europe and Asia. The yield of oil is small and it contains pinene, camphene, borneol, etc. It is used in medicine and occasionally in perfumery—small quantities replacing to some extent the oil distilled from spikenard, but now practically unobtainable.

Vanilla Pods are the prepared unripe fruits of *Vanilla planifolia*, N.O. Orchidaceæ, a plant indigenous to tropical America and cultivated in Java, Reunion, Bourbon, etc. The fruits are gathered in the unripe condition and afterwards dried in order to develop their odour, which appears to be due to fermentation. The pods are about 20 cm. in length and are filled with very small, black, shining seeds, which adhere to each other, owing to the glutinous balsam with which they are coated. This balsam contains the odoriferous principle vanillin, but owing to the presence of other aromatic substances the perfume is much more delicate than that of synthetic vanillin. There are several kinds of vanilla pods, the finest being Mexican; these, however, are usually subdivided again into three varieties according to their source (from cultivated or wild plants, etc.). Mexican vanilla, when obtainable, is very expensive, and in commerce is largely replaced by Bourbon Vanilloes, the odour of which recalls heliotropin as well as vanillin. An interesting and detailed account of the different varieties and the artificial fecundation of the flower is given by Sawer.[1] The use of vanilla pods in perfumery is very limited as they have been largely replaced by artificial

[1] "Odorographia," first series (1892), 150.

vanillin, which is cheaper and easier to handle. If desired, however, a strong alcoholic tincture can be prepared, and is useful in the compounding of artificial ambers.

Vanillin is a white or yellowish-white crystalline (needles) substance, melting from 81° to 84° C. according to its purity. It is prepared artificially on a large scale both in Europe and America, and may be obtained from iso-eugenol by oxidation, from guaiacol by the introduction of an aldehyde group, and from protocatechuic aldehyde by methylation. It is liable to adulteration with acetanilide, but more frequently with acetyl-iso-eugenol, the latter often being responsible for products of inferior odour. Vanillin is found in nature in the balsams of Peru and Tolu, in gum benzoin, and may be seen on the surface of the vanilla bean, where it crystallises as a whitish bloom. It has recently been observed by E. O. von Lippmann[1] as a constituent of the blue flowers of the potato plant. Vanillin is one of the important articles used by the perfumer, being extensively employed as a fixer, modifier, and blender. If judiciously applied it will "sweeten" any perfume and combines well with heliotropin, coumarin, and benzyl iso-eugenol for giving "body" to a "thin" odour. In cases where it is not advisable to use heliotropin, traces of benzaldehyde or methyl paratolyl ketone added to it will after maturing produce an odour effectually resembling piperonal. In combination with small quantities of coumarin, it is the basis of all cheap essences of vanilla.

Veratrine is a mixture of several of the alkaloids obtained from cevadilla, the dried ripe seed of *Schœnocaulon officinale*, N.O. Liliaceæ, a plant grown in Mexico. It is a very poisonous body and is violently sternutatory. Veratrine is used in preparations for the hair.

Verbena Oil (genuine) is obtained from the leaves of *Verbena triphylla* (*Aloysia citriodora*), N.O. Verbenaceæ, a plant believed to be a native of Chili, and now cultivated

[1] Schimmel & Co., "Report" (1919), 76.

in the south of France, where most of the oil is distilled. This is a yellowish liquid with a fragrant, lemon-like odour and is infinitely superior to the so-called verbena oils, which are in reality distilled from lemon-grass (*which see*). The general characters of the two oils show a close resemblance, which is attributed to the citral contained by both. These oils should not be confused with **Spanish Verbena Oil**, which is distilled from *Thymus hyemalis*, N.O. Labiatæ. Vervain oil blends well with orris, iso-eugenol, rose, and heliotropin, and is admirably fixed by means of labdanum, benzoin, elemi, or olibanum. Perfumes of this type are great favourites for bath preparations, and the following formula will produce satisfactory results :—

Verbena oil, genuine	600 c.c.
Rose synthetic	100 „
Heliotropin	50 grams
Methyl anthranilate	20 „
Phenyl ethyl alcohol	50 c.c.
Linalol	50 „
Ionone, beta	20 „
Labdanum R.	10 „
Benzoin R.	100 „

Vert de Violette is the name given to methyl heptine carbonate (*which see*).

Vetivert Oil is a viscous liquid having a remarkably persistent odour, and is obtained from *Vetiveria zizamoides*, N.O. Graminaceæ. The plant is a tall, erect perennial tufted grass, growing wild in different parts of India, where the roots are known as khus-khus, and are often woven into mats for covering windows, etc. The oil is obtained by steam distillation of the roots, which are first coarsely ground and digested with water. Distillation is slow as the boiling-point of the oil is high, and two fractions (light and heavy) can be separated by first using the steam jacket of the still and afterwards applying direct steam at high pressure. English vetivert oils are considered to be much finer products than foreign oils, and this may be due to

their being single distillates. Reunion oil is cheaper, and the difference in odour may be attributed either to the above cause or to the fresher nature of the raw material. Vetivert oil is one of the finest fixatives known and is much used for this purpose. Traces are sufficient for the rose and opoponax type of perfume, while much larger quantities may be employed in conjunction with patchouli as a basis for perfumes of oriental type. The following will give pleasant results :—

Vetivert oil—English	500 c.c.
Heliotropin	200 grams
Vanillin	100 „
Rose synthetic	100 c.c.
Jasmin synthetic	100 „

By extracting the roots with volatile solvents a resinoid is obtained which offers a cheap and good substitute for the oil.

Violet.—*Viola odorata* is a perennial herb of the N.O. Violaceæ, native to this country, but largely cultivated in the south of France for its perfume. It is used to some extent in medicine as syrup of violets. All violet perfumes have as their base ionone, together with modifiers and blenders. The finest varieties contain a proportion of natural violet extract. Good fixatives are floranal and benzyl iso-eugenol. For further details reference should be made to the monograph.

Violet Ketones—*see* Ionone.

Violet Leaves are extracted by volatile solvents for their extremely odorous principles, and no violet perfume can be said to be perfect without the addition of this product. Its odour is slightly earthy and far from attractive. It is imitated artificially by methyl heptine carbonate (*which see*). The extract is obtainable either as a concrete or as a colourless liquid—the latter product being much easier to handle and more esteemed. In violet ottos up to

[*Roure-Bertrand Fils.*

FIG. 12.—Gathering Violets.

[*To face page* 150.

5 per cent may be employed for "leafy" effects, but for normal compositions 3 per cent should not be exceeded.

Viverra Civetta and Zibetha—*see* Civet.

Wallflower.—*Cheiranthus cheiri* is a perennial plant of the N.O. Cruciferæ, and is frequently known as giroflée. Garden varieties are numerous and very popular on account of their fragrance. The flowers yield about 0·06 per cent of essential oil by extraction with volatile solvents, and distilling the extract with steam. Wallflower perfumes may be prepared synthetically, but none are perfect without traces of *p*-cresol methyl ether. For further details reference should be made to the monograph.

Waxes.—Several varieties of waxes are useful in the manufacture of toilet articles, but only the unimportant ones are briefly described here. Others such as white beeswax, cetaceum, etc., are dealt with under their own names.

Carnauba Wax is a hard, inodorous, and tasteless solid extracted from the leaves of *Copernica cerifera*, N.O. Palmæ. Chief constituents—cerotic acid and myricyl alcohol.

Chinese Wax (Insect Wax) is an insect secretion from *Coccus ceriferus*, and resembles cetaceum. Chief constituent—ceryl cerotate.

Japan Wax is extracted either by volatile solvents or hot pressure from the fruit of *Rhus succedanea*, N.O. Anacardeaceæ, principal constituents—palmatin and its acid. Used in the preparation of pomades and when mixed with castor oil and *repeatedly melted*, makes a transparent article.

Myrtle Wax is obtained when the berries of *Myrica cerifera*, N.O. Myrtaceæ, are boiled with water. It is a hard green solid and is imported from America. Chief constituent—palmatin.

Wild Pimento Oil has been distilled in Jamaica from the leaves of *Amonis Jamarcensis*, N.O. Scitaminæ. It has a fragrant odour, somewhat resembling that of spike lavender. It contained practically no phenols, the main constituent being lævo-linalol. It would probably prove

to be useful for perfumery purposes, if it could be supplied regularly in quantity.[1]

Wintergreen Oil—*see* under Gaultheria.

Witch Hazel—*see* Hamamelis.

Wool Fat—*see* Lanolin.

Wormwood Oil, also known as absinthe oil, is obtained by distillation of the leaves and tops of *Artemisia absinthium*, N.O. Compositæ, a plant native of northern Africa and southern Europe, and cultivated widely in the United States. The oil is of a greenish to bluish colour and possesses the characteristic and somewhat unpleasant odour of the herb. It is used principally in the preparation of the liqueur *absinthe*.

Yara Yara—*see* β-Naphthol Methyl Ether.

Ylang Ylang Oil is distilled from the flowers of *Cananga odorata*, N.O. Anonaceæ, a plant cultivated in the East Indies. The finest oil comes from the Philippines and is distilled in Manilla ; another good oil is imported from Reunion. These oils are superior to those described as *Cananga Oils* (*which see*), but they appear to have the same botanical source, the difference being probably due to the geographical distribution of the tree. Ylang ylang oil contains, among other bodies, linalol, geraniol, iso-eugenol, and methyl-para-cresol. Synthetic imitations of this oil are numerous, and many of them are nothing more nor less than the cheaper cananga oil deprived of its odourless terpenes, etc. For formula *see* Cananga Oil.

Zedoary Oil is distilled from the rhizomes of *Curcuma Zedoaria*, N.O. Zingiberaceæ, a plant cultivated in Ceylon. It is a somewhat viscid liquid of a greenish-black or reddish colour, and its odour recalls a mixture of ginger and camphor. Cineol has been identified as a constituent.

[1] "Year Book of Pharmacy" (1920), 59.

Zibethin is the name sometimes given to the civet obtained from the musk-rat, *Viverra zibetha*, a native of Asia, particularly Arabia, China, and the Philippines. It is employed in the form of a strong tincture.—*see* Civet. It is also the name given to synthetic civets (*which see*).

Zinc Stearate is one of the more recently introduced compounds for use in cosmetic powders and creams. It is a light, smooth, unctuous, white powder possessing remarkable adherent qualities and has real hygienic properties. In face powders it may be used up to 10 per cent, but the resulting product is rather light. Half this quantity is about the ideal medium, and it will dispense with the use of vanishing creams as a basis for powder when applied in natural light. When used in creams it will whiten the skin to which it is applied, but not to such a noticeable degree as the effect produced by the use of zinc oxide.

PART II

PERFUMES

PART II.

CHAPTER I.

THE PRODUCTION OF NATURAL PERFUMES.

1. The perfume in the plant—Dr. Charabot's researches.
2. Times of new crops of the more important oils, flowers, etc.
3. The separation of odoriferous materials from the plant by means of
   (*a*) Distillation.
   (*b*) Expression.
   (*c*) Extraction by enfleurage, maceration, and volatile solvents.

THE PERFUME IN THE PLANT.

(*Dr. Charabot's Researches.*)

NATURAL perfumes, one of the most marvellous phenomena of plant metabolism, probably reach their highest degree of excellence in the fragrance exhaled by fresh flowers. This fragrance is due to the minute traces of essential oil which exist in the petals, sometimes in the free state as in rose and lavender, and occasionally in the form of a glucoside which, under favourable conditions, is decomposed in the presence of an enzyme or ferment, as in jasmin and tuberose. The existence of a volatile oil, however, is by no means confined to the inflorescence, but frequently occurs in other parts of the vegetable organism.

For example, it is found in the

Flowers of, cassie, carnation, clove, hyacinth, heliotrope, mimosa, jasmin, jonquille, orange blossom, rose, reseda, violet, and ylang ylang.

Flowers and Leaves of, lavender, rosemary, peppermint, and violet.

Leaves and Stems of, geranium, patchouli, petitgrain, verbena, and cinnamon.

Barks of, canella, cinnamon, and cassia.
Woods of, cedar, linaloe, and santal.
Roots of, angelica, sassafras, vetivert.
Rhizomes of, ginger, orris, and calamus.
Fruits of, bergamot, lemon, lime, and orange.
Seeds of, bitter almonds, anise (both kinds), fennel, and nutmeg.
Gums or *Oleo-resinous exudations* from, labdanum, myrrh, olibanum, Peru balsam, storax, and tolu.

Then again, different varieties of plants produce aromatic bodies of slightly dissimilar odour, as is shown by the numerous roses such as the red rose, the white rose, and the Marechal Niel, while yet again, the *same* plant, grown under different conditions and in different soil, will often yield an essential oil of entirely different bouquet, as is demonstrated by the lavender of Mitcham and of France or by the geranium of Vallauris and of Bourbon.

All these remarkable variations present a problem which has for many years been studied by Dr. Eugene Charabot,[1] the distinguished French scientist, and his co-workers, Messrs. Gatin,[2] Hébert, and Lalone.

They regard the problem as embracing the following points :—

(*a*) The formation and circulation of the odoriferous constituents.

(*b*) Their evolution and the mechanism of that evolution.

(*c*) The creation of the perfumes themselves.

(*d*) Their physiological influence on the plant.

In an important and recent communication to the Académie d'Agriculture de France,[3] Dr. Charabot elaborates these points most clearly by considering the perfume first in the case of the whole plant and then in the case of the flower only.

[1] Charabot, "Les principes odorants des Végétaux," 1912.
[2] Charabot and Gatin, "Le parfum chez la plante," 1908.
[3] "La Parfumerie Moderne" (1921), 76.

He says : " When the plant is examined the odoriferous materials only appear in the young organs and continue to form and accumulate with decreasing activity until blossom time ; by diffusion they go from the leaf to the stalk and thence to the flower.

" During the process of fecundation a certain quantity of essential oil is consumed by the inflorescence, and as a practical consequence the gathering of perfume-producing plants should be made just before fertilisation is accomplished. Once this process is complete the fragrant principles redescend into the stem and diffuse into the other organs, that migration being stimulated by the drying of the inflorescences, which increases the osmotic pressure and partially precipitates the less soluble products.

" In considering the flower only, it is known that certain varieties (after collection) produce fragrant bodies when placed in such a condition that their vital functions may still be exercised, while in other cases the flower contains all its odoriferous principles in the free state, and it is impossible for it to produce new fragrant materials, even though it be still living."

The conclusions arrived at by Dr. Charabot after a study of the evolution of odoriferous compounds and of their mechanism are as follows : " The esters, so frequently found in essential oils, are formed in a particularly active manner in the green part of the plant, by the action of acids on the alcohols. This phenomenon, characteristic of the chlorophyll region, is influenced by an agent, probably a diastase of reversible action, which functions as a dehydrating body. The influences capable of modifying the plant in order to adapt it to an intense chlorophyllic action at the same time aid the formation of esters, this being favourable to the mechanical elimination of water.

" Thus, the functions of chlorophyll tend to acquire a new significance ; not only do they assure the fixation of carbonic acid gas by the vegetable tissues, not only do they, in assisting transpiration, effect the circulation of the liquids which bring and distribute the materials necessary to the mineral

nutrition of the plant, but they also, during the assimilation of carbon, actively assist condensation, enabling the transformation of a simple chemical body into one of those innumerable complex substances, the study of which has puzzled the shrewdest chemist.

"When the alcohol is in the proper state to easily lose the elements of water, it gives birth to the esters, and the corresponding hydrocarbon at the same time, or briefly put, the first transformation takes place in the chlorophyll region by way of dehydration.

"On the appearance of the flowers (those organs in which the fixation of oxygen by the tissues is particularly intense) it is possible that the alcohols and their esters are converted into other oxygenated products, the aldehydes or ketones, with at the same time the liberation of the energy necessary for fecundation.

"A large number of odoriferous materials, varying greatly in their functions and their chemical structure, may be produced by the splitting up of glucosides. When the generality of such a mechanism is admitted, it is easy to give an explanation of the observed facts relating to the formation of odoriferous materials and to their sudden appearance in this or that part of the vegetable organism. If the glucoside, which is formed in the green part of the plant, immediately encounters a medium whose conditions are favourable to its decomposition, the essential oil appears there at once and begins to circulate, to perform evolutions, and to play its part. In other cases, the glucoside will only meet the ferment capable of splitting it up in the flower. Only after having circulated in the plant and reached the flower, being modified more or less the whole way, will the glucoside be able to liberate the constituents of the essential oil. The flower only will then be odoriferous. The formation, in certain flowers, of new quantities of essential oil in proportion to the quantity of essence removed is explained by the phenomenon of chemical equilibrium, resulting from the reversible reaction :

$$\text{Glucoside-water} \rightleftarrows \text{glucose-essential oil.}$$

"The production of essence ceases when the state of equilibrium is attained. But, when the odoriferous material is removed in proportion to its formation, the reaction of division can go on until the whole of the glucoside is decomposed. From these conclusions it will be easy to understand their application in the extraction of flower perfumes, especially by enfleurage."

With regard to the physiological influence of aromatic materials, it was assumed formerly that they were of little use in the vegetable organism. It has been noticed by Dr. Charabot and his co-workers, that, on the contrary, they can be employed by the plant, especially when the latter are sheltered from the light and do not assimilate the carbonic acid gas of the air with the same power. They participate in a normal manner in the work of fecundation and of the formation of the seeds, during which time they are partially consumed.

Before leaving the subject of plant metabolism let us take a concrete example of the marvellous changes which occur in the composition of an essential oil—namely, that which is produced by the orange plant. If an essential oil is distilled from the inflorescences when they are in full flower and before fecundation has taken place, the product will have a comparatively high content of esters and other oxygenated bodies and be relatively low in terpenes.

If the orange flowers are fertilised and the fruit allowed to develop slightly, an essential oil is obtained on distillation that contains much less oxygenated constituents and a larger proportion of terpenes than the oil distilled from the fresh flowers.

Again, supposing the fruit is allowed to become fully grown and the essential oil expressed from the mature peel, it will be found that the oxygenated constituents have decreased to an almost negligible percentage and their place taken by terpenes.

TIMES OF NEW CROPS.

January.—Bois de rose, clove, linaloe, bergamot, lemon.

February.—Cassie, mimosa, bergamot, lemon.

March.—Violet, citronella, clove, Bourbon geranium.

April.—Carnation, jonquil, narcissus, hyacinth.

May.—Rose, orange blossom, rosemary, Bourbon vetivert, Algerian geranium, linaloe, thyme.

June.—Rose, petitgrain, cassie, bois de rose, vetivert, Bourbon geranium.

July.—Jasmin, French lavender, Algerian geranium, lime, rose, rosemary, thyme.

August.—Jasmin, tuberose, lavender (English and French), caraway, lemon-grass, English peppermint, Florentine orris.

September.—Aniseed, jasmin, tuberose, Ceylon citronella, English lavender, palmarosa, English and American peppermint, spearmint, French geranium.

October.—Jasmin, tuberose, caraway, spike lavender, Sicilian orange, palmarosa, French geranium, Florentine orris.

November.—Cassie, Bourbon geranium, lemon, lime, American peppermint and spearmint, santal (Mysore auctions).

December.—Cassie, bergamot, lemon, lemon-grass, palmarosa.

THE SEPARATION OF NATURAL ODORIFEROUS MATERIALS.

Production.—The manufacturing processes employed may be conveniently classified as follows :—

1. *Distillation* (geranium, lavender, neroli, rose, etc.).
2. *Expression* (citrus oils).
3. *Extraction* by means of (*a*) enfleurage, (*b*) maceration (*c*) volatile solvents.

1. **Distillation.**—This process in a crude form dates back to the times of the ancients, when fire was regarded as a

[*Antoine Chiris.*

FIG. 13.—Geranium ready for Distillation.

[*To face page* 162.

supernatural element. Among the earliest types of apparatus were the *Cucurbita*, the *Alembic*, and the *Berchile*, from which has gradually been evolved the distilling apparatus of modern times. The process of evolution was slow up to the middle of the last century, but was hastened in later years, largely on account of the remarkable advances made in the perfume industry. During this period the improvement in the construction of steam and vacuum stills has not only increased and cheapened the yield of oil, but has also materially enhanced the purity of the product. It does not, of course, follow that the employment of modern apparatus is universal, for even to-day, in more or less remote parts of the world, comparatively crude open fire stills are used, and their careless manipulation is frequently responsible for the oils of indifferent quality occasionally met with in commerce.

Volatile oils, as a general rule, are highly odorous, mobile liquids, and may be obtained from the plant by steam distillation without undergoing decomposition. They usually contain numerous individual bodies, differing in chemical constitution, and to one or more of these the characteristic odour of the oil is due. In many cases, these particular constituents have been definitely established, as, for example, the odour of almond oil is attributed principally to *benzaldehyde*, of bergamot oil to *linalyl acetate*, and of clove oil to *eugenol*. In several cases, however, where the oil is of more complex composition, the characteristic odour is believed to be due to the perfect blending of a number of the aromatic constituents. This is well illustrated in the case of otto of roses, where the esters of the alcohols *geraniol* and *citronellol*, together with the *higher aliphatic aldehydes*, although present in very small quantities, undoubtedly play an important part in the determination of the distinctive rose odour.

Different distillation processes are employed for separating the essence from the plant, and the choice of method depends upon the nature of the product and the yield that can be obtained. Several factors contribute towards the amount of essential oil that can be "won" from the plant,

and not least of these is the attention paid to its cultivation. In many cases, of course, the plant grows wild, and no effort has been made to study the particular kind of manure that could be used to materially increase the yield of oil. In a few instances, however, the importance of this part of the "process" has been realised, and in the case of lavender proved by the experiments of Professor Zaccharewitz, of Avignon, who found that the yield of oil could be more than doubled by the use of an artificial manure consisting of sodium nitrate 1, potassium chloride 1, calcium superphosphate 3. Another important factor is the preparation of the plant for the still, and upon this will depend not only the yield of oil but also the rapidity with which the process may be completed. The state of the raw material must be such that the steam or water can completely permeate the mass and carry over with it into the condenser every particle of essential oil present. In many cases, such as flowers, leaves, and grasses, the raw material requires no special treatment, but sometimes the complete extraction of the volatile oil would be impossible without its previous preparation. In the case of hard, woody bodies, shaving or grinding may be necessary, in the case of some fresh roots or whole herbs they may be dried and then cut, while yet again in the case of seeds, fruits, and barks, crushing or disintegration may prove sufficient. In a few instances, notably berries, these preliminary preparations may be unnecessary because the epidermis is broken by internal pressure, induced by the high temperature of the steam. Raw materials are seldom placed in the still in a *fine* powder since they are apt to form an impenetrable mass when the steam is turned on. In consequence this escapes either round the sides or through cracks, and the major portion of the charge remains untreated.

In some parts it is the common practice to dry the raw material before distilling, but this may be due to the distance of the place of collection from the apparatus or to the congestion of the stills at the time ; in the case of orris the drying of the roots is necessary for the development of their odour.

[*Pilar Freres.*

FIG. 14.—Distillation Plant.

[*To face page* 164.

The processes of distillation may be divided broadly under the two following heads :—

1. By boiling with water.
2. By means of steam ("dry or live").

The first method is the oldest and the easiest. It is

FIG. 15.—Type of apparatus used for the distillation of plants such as Peppermint and Lavender. It has a capacity of 1200 gallons and will take a charge of one ton. The exhausted herb is discharged by lifting the false bottom.

still applied by the peasant who grows his own plants and is too far from the factory to convey them there. With careful application good results are obtained, but if a part of the raw material should not be covered with water and come in contact with the hot sides of the apparatus, destructive distillation takes place with the production of obnoxious

bodies and a consequent impairment of the odour of the final product.

This last danger is overcome by the application of the second method, when the steam is produced in a boiler or

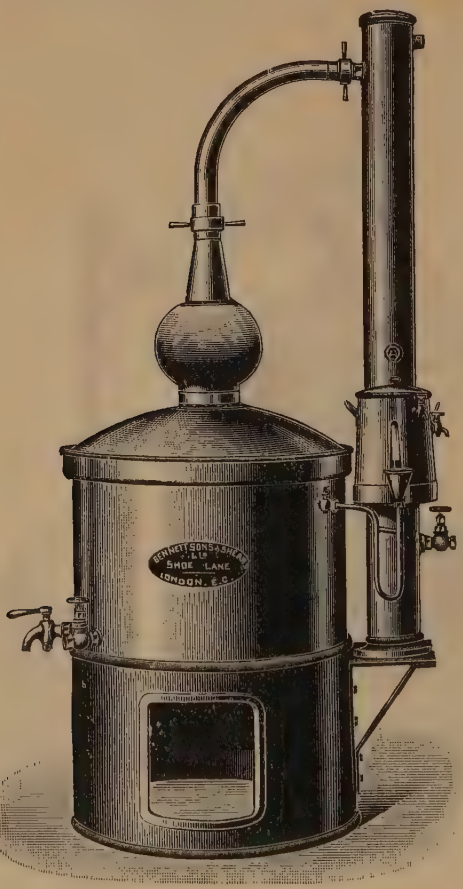


Fig. 16.—Still used for the Extraction of Essential Oils. It is fitted with a separator and connection for returning the aqueous distillate to the still.

other vessel away from the still. In this case the apparatus is fitted with a steam jacket, or a steam coil (for "dry steam" distillation), and also with a "live steam" inlet (see Fig. 15). Either system may then be used, and if necessary may be

conducted under reduced pressure (*in vacuo*). The methods adopted for supporting the raw materials inside the still vary—in many cases a perforated sheet of metal or false bottom is used (see Fig. 15), while in others a basket of the same diameter as the still and fitting closely to its sides is suspended from the top and is easily removed.

The rate of distillation of the essential oil depends mainly on the condition of the raw material and the rate at which the volatile oil is liberated from it. This is

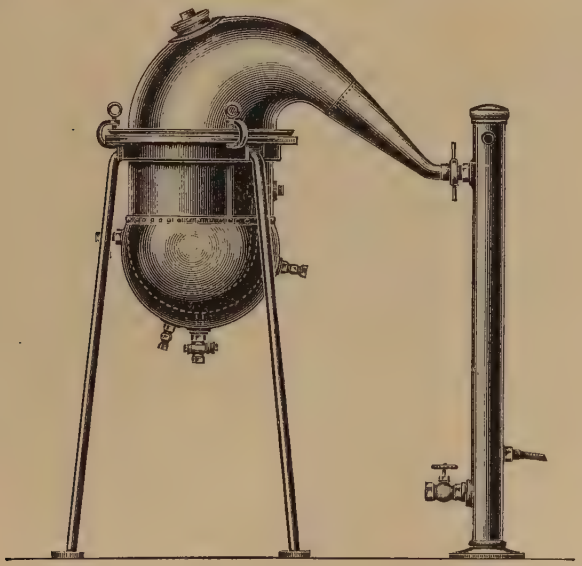


Fig. 17.—Distilling apparatus used for the Rectification of Essential Oils.

influenced to some extent by its vapour pressure and the molecular weight of its constituents.

Condensation is effected by means of water-cooled coils or vertical tubes, the latter being very efficient and rapid for many products. If they are too fast, however, air cooling is resorted to as in the case of orris oil.

Many ingenious forms of receivers are in use whereby the oil flows from one exit and the condensed water runs back into the still automatically (see Fig. 16). Florentine flasks are also used, both singly and in cascade. In the case

of crude oils rectification is effected by redistillation with steam (see Fig. 17).

In a number of instances, notably in those of orange flower and rose, the oil, or some of its constituents are slightly soluble in the aqueous distillate, and even by subjecting the fragrant water to cohobation the complete separation of the volatile oil is difficult and frequently impossible. Such waters are stored as shown in Fig. 18, and enter commerce as Aqua—Trip.

In some works these waters are specially prepared and are then known as "weight-for-weight" products. For example, 100 lb. of roses and a sufficient quantity of water are distilled until the yield is 100 lb. of fragrant rose water. Sometimes the distillate is separated into two or even three fractions; the first 50 lb. constituting the *quadruple superior*, and the remainder the *triple superior*.

Expression.—There are three main processes for the separation of so-called *Citrus* oils from the peel of the lemon, orange, bergamot, and lime. They may be described as—

(*a*) Sponge process.
(*b*) Ecuelle method.
(*c*) Machine process.

They are applied to all the above oils, but to a less extent to lime, since a large proportion of the oil of commerce is obtained as a by-product of distillation in the West Indies.

The Sponge Process.—The oil cells of the rind of any of the above fruits are easily broken, as can be shown by turning a piece of lemon peel backwards. This process on a large scale, therefore, does not offer any serious difficulty, nor does it require very heavy pressure for the extraction of the oil. It may be divided into three stages: (1) the preliminary preparation of the peel; (2) the expression of the oil; (3) the clarification of the oil. According to the manner in which the preliminary operation is carried out,

[*Roure-Bertrand Fils.*

Fig. 18.—Storage for Distilled Aromatic Waters.

[*To face page* 168.

so is the process named. When the fruit is cut across the shorter axis and the pulp removed by a spoon, it is known as the *Scorzetta*, and the sponges used are cup-shaped. When the rind is cut off in three strips and the pulp remains intact, it is known as the *Spugna*, and the sponges are flat or nearly so. This stage of the process is comparatively light work and is done by women. Before expression, the peel is either moistened with or steeped in water, which is supposed to facilitate the removal of the oil by making the cells more turgid. The drained peel is pressed by men who sit on low forms and allow the oil to collect in a shallow earthenware bowl in front of them, the sponges used for the purpose resting on sticks attached to the edges of the receiver. The oils from the different jars are mixed and allowed to stand until any juice has separated at the bottom. It is afterwards filtered and stored in coppers. Any residues that may contain oil are diluted with water and the oil recovered by distillation. Such products are always of poor quality and are therefore mixed with better oils. The hemispherical rinds from the *Scorzetta* process are pickled with salt and exported as *Salato*. The juice from the pulp is used in the production of *Citrates*.

The Ecuelle Method is practised more in the north of Italy, and consists of rolling the fruits about in hollow vessels, the walls of which are covered with spikes. The oil cells are punctured, and the liquid flows to the bottom, being collected in a receptacle situated in the handle of the vessel. The product is then clarified as described above.

Machine Processes have been applied in the manufacture of lemon and bergamot oils during recent years. One consists of a mechanical adaptation of the sponge process, when the pressure is applied with a lever. Another hand machine consists of two channels between which the fruit is rolled ; the skin is lacerated by means of spikes, and the mixture of oil and juice is collected and subsequently separated and clarified as above described. A complete account of this is given by P. Mirgodin, in " La Parfumerie

Moderne" (1921), 257. Still another machine of similar type, mechanically driven and dealing with graded fruits, is described in the *P. and E.O.R.*, Special Issue (1922), 208. The most modern and efficient process, however, is that devised by Mr. Alex. H. Bennett, of Messina, in which centrifugal separators are employed. The following abstract of this process is reproduced by kind permission of the editor of the *P. and E.O.R.*, and is best understood by a reference to the diagram which appeared in the special issue (1922) of that valuable paper: "The whole fruit, without any previous preparation other than washing, is crushed in a mill between two pairs of rollers placed vertically, one below the other. In this process the essence-bearing cells of the peel are all broken and the essence thus liberated mingles with the juice simultaneously squeezed out from the pulp. The rollers are surrounded by a water-tight casing, and the hopper of the mill is covered by a close-fitting, dome-shaped lid, the fruit being admitted by a shoot at one side, while from the middle of the cover a fine spray of water is directed downwards on to the first pair of rollers, and assists in washing the mixed juice and essence away from the residues. The mass is discharged from the lower part of the mill on to a wide, wooden grating, which retains the crushed fruit and allows the liquid, carrying in suspension a considerable amount of solid particles, to pass freely through it. On this grating the pulpy mass is allowed to drain for some time, and is then transferred to presses of the form usually employed in citrate works, where the remaining juice is squeezed out. The liquid passing through the grating runs down the sloping bottom of the tank and through a tube to the drainers, made of sheet aluminium pierced with tiny holes. In these strainers collect the pips and the coarser particles of skin or pulp that may be carried down by the liquid, which thus, partially clarified, passes into a tank from which it is led by a tube to the centrifugal machines. These are of the milk separator type, somewhat modified internally to permit of the easy passage of suspended solid particles to the wall of the drum, and to allow

space for the accumulation there. The rate at which the liquid enters the drum is controlled by a stopcock in the tube, and when this is properly regulated, clear essence is continuously discharged from the upper or cream cock of the centrifuge and collected in a suitable vessel, while juice freed from essence and containing but little matter in suspension is delivered from the lower cock and led by a pipe to an underground reservoir, whence it is pumped to the citrate-making plant as required. The centrifuges are employed in pairs, as after a certain period (one or two hours, depending on the state of the juice) the drum becomes overcharged with the deposit of finely divided solid matter, and must be dismounted and washed, the work being continued in the meanwhile by the other machine." (A most complete and up-to-date account of the Italian essence industry is contained in the *P. and E.O.R.*, above referred to, together with much useful analytical data, etc.)

Extraction.—Reference has already been made to the separation of volatile oils from plants (*and their flowers*) by means of distillation, and in several instances this process yields oils of exceptional purity and of very fine aroma. In a large number of cases, however, the application of this method does not produce products which are entirely satisfactory on account of the fact that many unstable aromatic substances are damaged or completely destroyed by the high temperature of steam, while in other cases the *quantity* of essential oil that could be obtained would be negligible. In view of these facts, other methods are used for the separation of the fragrant bodies from the flowers, and they are known as **extractions by means of solvents.** The materials used for this purpose are broadly classified as **volatile** and **non-volatile,** while the latter are again subdivided according to the conditions of *temperature* appertaining during the process. These distinctions are clearly indicated as follows :—

1. Extraction by means of non-volatile or fixed solvents such as animal fats or vegetable oils.

(*a*) At normal temperatures—**Enfleurage.**

(*b*) With the application of heat—**Maceration.**

2. Extraction with **Volatile Solvents** such as petroleum ether, etc.

The choice of process depends upon several factors, the more important being :—

(*a*) That certain varieties of flowers produce fragrant materials when placed in such a condition that their vital functions may still be exercised.

(*b*) That other varieties of flowers contain all their odoriferous principles in the free state, and are unable to produce *new* fragrant materials, even if still living.

Among the former class may be included jasmin and tuberose, while typical examples of the latter are rose and orange flower. The process which is best applied to the extraction of the odoriferous bodies from any particular flower has been determined by many years of experience in the south of France.

Enfleurage is applied to jasmin, tuberose, jonquille, muguet, etc.

Maceration gives better results with cassie, rose, orange blossom, violet, etc.

Volatile Solvents are used for extracting reseda, rose, jasmin, jonquille, tuberose, violets, cassie, orange flowers, carnations, mimosa, heliotrope, oakmoss, stock, etc.

It will be noticed that certain flowers, such as rose and violet, may be extracted either by maceration or by volatile solvents, and a good product can be obtained by either process. On the other hand, certain flowers, notably jasmin, may be extracted by enfleurage or volatile solvents, but the product obtained by the former method is superior in odour rather than in yield. Niviere[1] gives the following explanation of these differences :—

"It is quite certain that the jasmin flower contains one

[1] "La Parfumerie Moderne" (1921), 225.

or more glucosides. I had the opportunity of making a great number of experiments on the preliminary hydrolysis, and I always obtained a yield in essence greater than that obtained by a direct extraction without hydrolysis. However, if I compare the yields in essence by extraction with those by enfleurage, I notice that the differences are not very great, if only the extraction of *pure* essence is considered. During ordinary manufacture, 1000 kilos of jasmin flowers produce by enfleurage 5 to 6 kilos of pure concrete ; extraction by means of petroleum ether only gives 1·300 to 1·400 kilos of absolute essence ; the net yield accordingly seems to be 4 to 5 times greater by the enfleurage process. But it must not be forgotten that by this last method glycerides, rich in olein, are dissolved by the alcohol during extraction of the enfleurage pomade, and that in reality the jasmin concrete, from pomade, only contains 25 to 28 per cent of essence, the remainder consisting of fatty materials. What remains certain is that the two essences are different both in odour and in chemical composition, as demonstrated by Hesse. In the enfleurage product, the presence of indol is very noticeable, and is probably due to the splitting up of a glucoside under the influence of an enzyme. The fact of the vitality of the flower only intervenes in the direction of hydrolysis ; the flower no longer produces essence, but splits up by hydrolysis the odourless or insoluble materials before they are absorbed by the fats. The fats dissolve the essence by contact. The industrial practice shows that the flowers must be in contact with the grease. All experiments to save labour, based on the non-contact of the flowers with the fat, in order to obtain a quicker 'defleurage,' have failed. Concerning the use of these two essences in perfumery, it may be asserted that the enfleurage product is more tenacious than the absolute one. That peculiarity arises from the glycerides of the fatty acids, which act as fixatives, and furnish also their sweet odour of fat. The objections to the use of concretes is that they produce extracts which become rancid after some months, especially

if the containers have been exposed to strong light." This would appear to indicate that, if jasmin flowers were submitted to a preliminary hydrolysis by acid or enzyme, *before extraction with volatile solvents*, the yield of oil would be increased.

Enfleurage is applied to those flowers which, even after removal from the stem, continue to produce perfume materials, and the process depends upon the capability of greases and fixed oils to absorb and retain these aromatic bodies when placed in contact with the flowers. It is applied, as stated above, to jasmin, jonquille, lily of the valley, reseda, and tuberose, and it results in the so-called "**pomades** for **washings.**" This process necessitates the use of "*chassis*," which are wooden frames, each supporting a glass plate. The cold or slightly warmed grease is uniformly distributed in a thin layer on both surfaces of the glass plate, a margin being left near the edges. The petals are then spread lightly on the fat as shown in Fig. 19, the absorption surface being increased by grooves made with a wooden spatula. Several chassis, thus prepared, are placed in tiers as illustrated so that the petals are enclosed between two layers of grease, both the upper and lower absorbing the perfume as it is given off. Fresh flowers replace the exhausted ones, daily in the case of jasmin, but in certain instances, notably jonquille, this period is extended. The chassis are turned over for each alternate application so that an even distribution of perfume results. The renewal of the flowers continues until the fat is fully charged, the resulting product, after removal, constituting the **Pomade.** This is stored as shown in Fig. 20.

The fats most commonly used are lard or beef suet, or a mixture of the two. They are specially purified and washed with alum solution, afterwards being preserved by digestion with benzoin or tolu (sometimes with the addition of orange blossoms).

The quality and cost of a flower pomade depend to a very large extent upon the care taken during their production and the cost of labour they have to support.

[*Lautier Fils.*

FIG. 19.—Enfleurage—placing the Blossoms on the Chassis.

[*Roure-Bertrand Fils.*

FIG. 20.—Storage of Pomades.

[*To face page* 174.

[*Lautier Fils.*

FIG. 21.—Machine for removing Blossoms from the Chassis. Note the one on the left after passing over the brush.

[*See page* 175.

[*Lautier Fils.*

FIG. 22.—Removing Embedded Stalks and parts of Flowers by Vacuum.

[*To face page* 175.

The manufacturer has always aimed to improve the preparation of pomades made on glass chassis, to diminish the loss of grease, and reduce the manual labour involved, but he has not, until recently, been successful in finding a really practical device. It was therefore necessary to adhere to the process just described, which entailed enormous working expenses.

A few years ago many Grasse manufacturers introduced a process whereby wire, silk, and yarn nets were placed upon the glass frame, between the layer of fat and jasmin flowers, as a perfume absorber. The results were not satisfactory, and this method had to be discontinued.

This problem has recently been solved by Messrs. Lautier Fils, who have devised and patented a machine for mechanically removing the flowers as shown in Fig. 21.

On the right-hand side a woman is seen ready to place on the machine one of the innumerable frames coated with jasmin flowers. This frame is immediately drawn into the apparatus, flower side downwards (towards the rapidly revolving brush), and is seen—two seconds later—on the left-hand side, entirely rid of the flowers, which are blown off and fall to the floor. Two women can pass a quantity of chassis through the machine, the number being increased according to the skill and experience of the operators.

The frame seen on the left of the photograph still contains some remnants of flowers, which are too minute to be extracted so rapidly by the machine, regulated so as to "snatch" the flowers as they pass by, without touching the grease coating in any way. The remnants of flowers are removed as shown in Fig. 22.

Four women, seated on the left-hand side, take off the small flower parts by means of a vacuum apparatus, the operation being exceedingly quick and the grease remaining untouched.

The woman seated on the right-hand side is seen removing with her fingers the flowers with which the frame is covered. This is the old-fashioned method already referred to above, where the flowers are removed

one by one and any remnants are taken off with either the fingers or small wooden or metallic sticks.

By means of this new invention, the fingers do not come into contact with the fat, as will be seen from Fig. 23.

On the contrary, with the ordinary old-fashioned method, the finger tips play the chief part, and they leave numerous unavoidable prints shown by the dark spots in Fig. 24, thus producing an irregular surface for the next application of flowers.

The advantages of this new machine method can be easily understood, for the rapidity of working is increased sixfold, and apart from the economy effected, there is absolute cleanliness, minimum loss of grease, and a maximum perfume yield.

Occasionally solid fats are replaced with either olive oil or liquid paraffin, in which case cloths are saturated with the liquid and spread on chassis supporting wire frames, instead of glass plates. When the oil is fully charged with perfume, the cloths are removed and submitted to hydraulic pressure. The perfumed oil so obtained is called **Huile Française** or **Huile Antique**. On extraction with one, two, or even three washings of alcohol, these products and the pomades yield the **Extraits** aux **Fleurs**, 1re, 2me, 3me, as the case may be. They are frequently sold as perfumes in this condition and without further treatment. The **Concretes Soluble** are obtained by removal of the alcohol from these *mixed* washings, the process being effected in a vacuum apparatus. In addition to the "absolute" essence, they contain the glycerides of the fatty acids which are soluble in the alcoholic menstruum. The proportion of "absolute" present varies, but as a general rule it is between 20 and 30 per cent of the total weight of "concrete soluble." The fat left behind after the various extractions is known as **Corps Épuisé** and is used in the soap industry.

Maceration consists in the extraction of the flowers by immersion in liquid fats or oils at a temperature of about 60° to 70° C. The greases or oils mentioned under

[Lautier Fils.

FIG. 24.—The irregular surface of the Grease after the parts have been removed by the old method. [*Lautier Fils.*
by the finger nails. Note the impression left

[*Roure-Bertrand Fils.*

FIG. 25.—Manufacture of Pomades (Maceration).

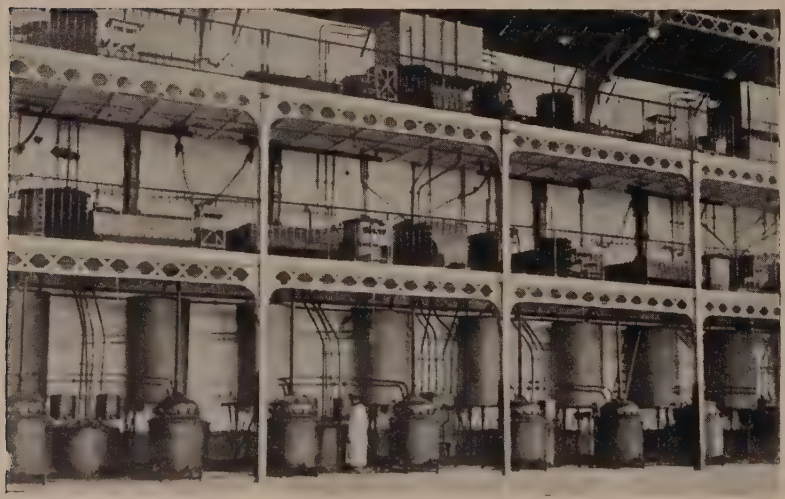
[*Lautier Fils.*

FIG. 26.—Manufacture of Pomades by Maceration.

[*To face page* 176.

[*Roure-Bertrand Fils.*

Fig. 27.—Press-room for Exhausted Flowers (Maceration).



[*Roure-Bertrand Fils.*

Fig. 28.—Extraction Plant (Volatile Solvents).

[*To face page* 177.

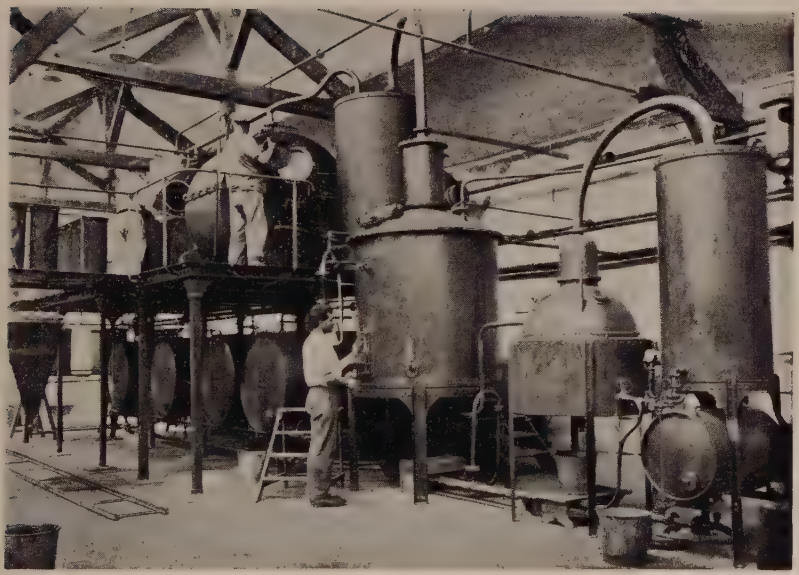
enfleurage are used for this purpose, but paraffin appears to find less employment than the others on account of its lower absorption capacity. The flowers treated by this process (cassie, rose, orange, violet, narcissus, muguet, etc.) are mixed with the hot greases in pans and the whole of the contents stirred for a known period (see Figs. 25 and 26). The cells containing the essential oil are ruptured by the heat and the aromatic constituent absorbed by the fat. When exhaustion is complete the contents of the pan are ejected on to a huge perforated screen and allowed to drain. The fat is collected and further quantities of flowers are mixed in with it, the process being repeated until the extraction media is thoroughly saturated—the exact weight of flowers for the completion of this process having been arrived at by years of experience. The exhausted flowers left on the screen contain quantities of perfumed grease, and they are placed in linen bags and submitted to hydraulic pressure for its recovery (see Fig. 27). Centrifugal apparatus is sometimes used for this purpose.

Volatile Solvents.—This process is of comparatively recent origin and was first experimented with by Robiquet in 1835. In later years other workers established the value of this method of flower extraction, but it was not until about 1890 that its real application on an industrial scale was attempted. Several solvents have been tried such as benzene, carbon disulphide, etc., but for various reasons they have been discarded, and the one in general use at the present time is petroleum ether, Sp. gr. 0·650 (15° C.). This is first purified by treatment with sulphuric acid and alkali and subsequently rectified. The extractors resemble a battery of percolators (see Fig. 28), each having a capacity up to 100 gallons and fitted with several trays or perforated cylinders, in which the flowers are placed. The vessels are hermetically sealed (see Fig. 30), and the solvent is allowed to run through them, remaining in contact with the flowers generally about eight hours. Three different portions of solvent may be applied during this period, the number of extractions and the time of each depending upon the

particular flowers under treatment. The volatile portion of the percolate is removed, primarily at ordinary atmospheric pressure, and subsequently in a vacuum apparatus. The resulting products, which are solid or nearly so, and contain the odoriferous materials together with the natural and insoluble plant waxes, are known as **Concretes** (*parfum naturel solide*). Twenty-five grams of this extractive represents about one kilo of pomade No. 36. The yield per cent of flowers (weight) is as follows for the cases cited :—

Cassie	about 0·4 per cent.
Jasmin	„ 0·2 „ „
Rose	„ 0·2 „ „
Violet	„ 0·15 „ „

In order to remove the plant waxes, the *concrete oils* are shaken with strong alcohol in machines called "Batteuse" (see Fig. 31), and the *insoluble* waxes removed by filtration. The alcoholic filtrate contains small quantities of *soluble* waxes, which are separated by cooling at about 20 degrees below zero. The **Absolute** flower oil is obtained from this dewaxed alcoholic solution, either by the removal of the solvent *in vacuo* or by the addition of salt, when the odoriferous essence separates on the surface and is collected. Standardised natural liquid absolutes are prepared from these essences by the addition of a neutral solvent and are completely soluble in alcohol. In a number of cases the absolute flower oil contains varying quantities of colouring matter, which depends upon the volatile solvent used for extracting the flower. The presence of these pigments is not always desirable when highly concentrated perfumes are being prepared, as they are liable to colour the handkerchief or dress to which they may be applied. In consequence, so-called **Colourless Absolutes** are in many instances manufactured, the separation of a portion of the pigment being effected by distillation in the presence of a neutral and odourless wax (*i.e.* paraffin wax). In the majority of cases, however, these products cannot be said to be *completely* colourless.



[*Pilar Freres.*

FIG. 29.—Extraction with Volatile Solvents.

[*To face page* 178.

[*Antoine Chiris.*

FIG. 30.—Extraction Plant.

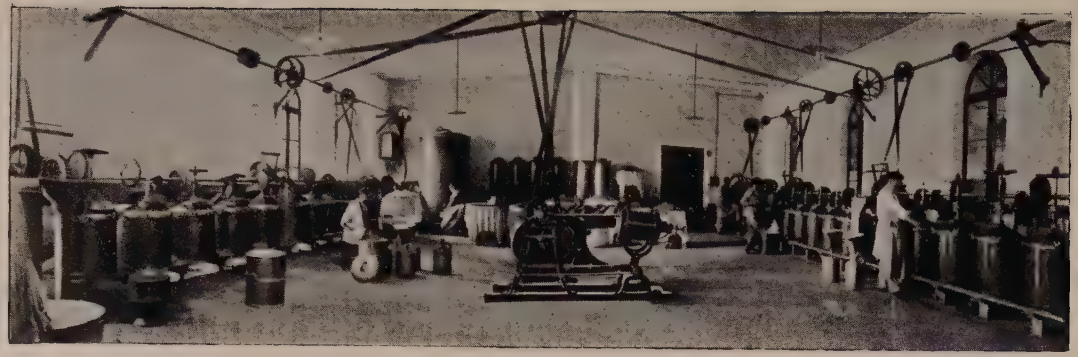


FIG. 31.—Extraction of Pomades with Alcohol (Batteuses).

[*Roure-Bertrand Fils.*

[*To face page* 178.

The following table shows the approximate weight of *absolute flower oil* that is required to produce one thousand of the type of perfume or cosmetic indicated :—

	Strength of Alcohol.						
	90 per Cent.	80 per Cent.	70 per Cent.	60 per Cent.	50 per Cent.	40 per Cent.	30 per Cent.
Extract No. 72 . .	25	—	—	—	—	—	—
Extract quadruple No. 36	22	20	18	12	—	—	—
Extract triple No. 24 .	15	13	11	9	7	—	—
Toilet waters . . .	5	4·5	4	3	2	1·5	1
Toilet creams . .	up to 5						
Toilet powders . .	up to 10						
Hair preparations . .	up to 8						

Note—These quantities are also applicable to *synthetics and terpeneless essential oils.*

In concluding this chapter it is interesting to note the average consumption of flowers at Grasse for the past ten years :—

Orange blossoms	2,200 tons
Roses	1,650 ,,
Jasmin	1,320 ,,
Mimosa branches	880 ,,
Violets	440 ,,
Tuberoses	330 ,,
Carnations	165 ,,
Cassie	110 ,,
Reseda	66 ,,
Narcissus	55 ,,

CHAPTER II.

FIXATION.

1. Introduction, pre-fixation, blending, final-fixation.
2. Natural fixators—animal, vegetable (including essential oils, balsams, gums, and oleo-resins).
3. Artificial fixators—synthetic aromatic chemicals, compounds (including ambers, floral fixators, oriental fixators, and toilet water fixators) with formulæ.
4. Classification of fixators—(1) essential oils, (2) balsams, gums, and oleo-resins, (3) synthetic aromatic chemicals.
5. Flower perfume fixators—classified and tabulated list of the more important floral odours with wide range of suitable fixators.

Fixation is *the* question of utmost importance in the manufacture of perfumes, and the demands of the public for bouquets that will "hold" has made this subject one of continuous study for the chemist. It is a curious thing that although the ancient Egyptians and Grecians had few materials and no technical knowledge such as we possess to-day, yet they were able to make perfumes of lasting fragrance. This has been recently demonstrated by the discoveries in the tomb of Tutankhamen. The tenacity of a perfume was esteemed in those days, as will be clear on referring to the works of Theophrastus (370 B.C.). Concerning odours he says: "Those perfumes whose scent is strongest get the best hold on the skin, head, and other parts of the body, and last the longest time: such are *megaleion*, Egyptian perfume, and sweet marjoram perfume. Those, on the other hand, which are weak and have not a powerful scent, since they are volatile and evaporate, also quickly come to an end: for instance, rose perfume and *kypros*. There are some, however, whose scent is even

better on the second day, when any heavy quality that they possessed has evaporated. Some again are altogether more permanent, as spikenard and iris-perfume, and the stronger a perfume is the longer it lasts." The same writer also refers to the properties of certain perfumes as follows : "The lightest are rose-perfume and *kypros*, which seem to be the best suited to men, as also is lily perfume. The best for women are myrrh-oil, *megaleion*, the Egyptian, sweet marjoram, and spikenard : for these, owing to their strength and substantial character, do not easily evaporate and are not easily made to disperse, and *a lasting perfume is what women require*." The fixative properties as a pre-requisite of a good perfume were appreciated still more at a later date, which is proved by the "Parfum à la Maréchale," made from the formula of Dejeans. This creation was in vogue in the eighteenth century on account of its fragrance *and persistence*. The original recipe for the "Poudre à la Maréchale" (1777) was as follows :—

Take—

4 oz. of ambrette.
4 „ „ clove wood.
4 „ „ coustadon.
2 „ „ calamus.
2 „ „ Florentine iris.
1 „ „ cloves.
1 „ „ dill seeds.
1 „ „ dried lemon peel.
1 „ „ dried orange flowers.
1 grain of ambergris.

Crush these things partly and pass through a sieve of silk. Repeat the operation until the whole has passed. Then put your powder in a bottle, etc. The extract was produced from these materials in later years by maceration in alcohol, and *it is noticeable that no mention was made of distillation*.

To-day the public insist on *every* perfume being tenacious, and the longer it will remain fragrant after the evaporation of the alcohol, the more popular becomes the perfume. Even in the case of eau-de-Cologne, which at

one time was required to be sweet and elusive, it is noticeable that a large number of users have shown a distinct inclination towards a toilet water of persistence, and in consequence perfumers have introduced amber Colognes, mimosa Colognes, etc. These perfumes bear very little relation in odour value to the original, but for tenacity they far excel it. Distillation has been referred to in the case of the extract à la maréchale, and had this process been applied, the persistence of the perfume would have suffered, although some of its fragrant constituents would have passed over with the alcohol. This analogy can be applied to almost any perfume, and it clearly shows that the volatile portions must be fixed by other less evanescent bodies. This, then, would indicate that the art of fixation lies in being able to select those substances which, when blended with the more volatile constituents of a perfume, will prevent their rapid evaporation and at the same time retain the predominating note of their fragrance, or put in another way—will equalise the different rates of evaporation of the various constituents. The group of bodies from which suitable fixatives for any perfume may be selected is a large one, and their odours may be classified under three headings :—

(*a*) *Pleasantly aromatic*, such as benzoin, olibanum, tolu, musk, ambergris, santal, salvia sclarea, benzyl isoeugenol, vanillin, coumarin, and heliotropin.

(*b*) *Disagreeable*, such as asafetida, valerian, civet, castor, and indol.

(*c*) *Neutral*, such as benzyl benzoate, ethyl phthalate, and glyceryl acetate.

All these bodies may be further classified as to their source, *viz.* animal, vegetable, and synthetic.

The addition of odoriferous fixators to basic perfume materials will modify them slightly, which in the manufacture of fancy bouquets is not of much consequence, since the blend will often acquire a new note that is inimitable. On the other hand, it is not so easy to compound a natural flower perfume where the accurate reproduction of the odour is imperative. This is a delicate and difficult,

[*Parfumerie Moderne.*

FIG. 32.—Cultivation of Clary Sage at Lyon in 1920.

[*Parfumerie Moderne.*

FIG. 33.—Other cultures of Clary Sage at Lyon in 1920.

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though not impossible, operation, and is facilitated by the use of those fixators which bear a close resemblance to the flower odour being imitated. These cases are aptly illustrated by the employment of orris oleo-resin in violet, benzyl iso-eugenol or vanillin in carnation and clove pink, piperonal-vanillone in heliotrope, hydroxy-citronellal in muguet and lilac, indol in jasmin, and rosindol in rose. In blending the above-mentioned perfumes it is advisable to add small quantities of the fixator at first and gradually increase the proportion until the desired balance in odour is obtained. This must, however, be done in separate stages, otherwise the final blend of the perfume will not be all that is desired.

The process may be conveniently divided into three steps :—

(*a*) *Pre-fixation*, or complete de-odorisation of the solvent.

(*b*) *Blending*, or the addition of modifying fixators during manufacture.

(*c*) *Final fixation*, or the admixture of such additional substances as will produce the desired tenacity and distinctiveness, without changing the basic odour.

Pre-fixation, or the de-odorisation of alcohol, is a matter of much importance, and this preliminary operation is now carried out scientifically and with considerable ease. At one time, owing to the imperfect methods of alcoholic rectification, it was customary to add to the spirit tonka-beans, orris or vetivert roots, vanilla pods, etc. These were allowed to macerate for months, and sometimes for years, when the alcohol lost any objectionable smell it possessed and became slightly fragrant. With the present excise duty such lengthy operations would never pay, and as a result other processes have been devised. The best method is to add an aromatic resin extract whose odour is similar to the perfume for which the alcohol is to be used. One gram of resin extract added to 1 litre of alcohol will neutralise its characteristic aroma in a few weeks without giving it any specific odour, and in conse-

quence the solution so obtained may be used for almost any perfume without much risk of spoiling the fragrance of the particular floral extract to be dissolved in it. A good example of such a resin for general use is benzoin R., but it must be remembered that the spirit containing it will, after volatilisation, leave a very thin film, having an almost imperceptible odour that will be at once lasting and satisfying to the user. It will be readily observed that this method possesses distinct advantages over the old one in that complete and identical results are obtained every time ; further, it will be noticed that definite basic blends can be repeated by the addition of known percentages of fixators. As an illustration of this point, the addition of 1 gram of each of benzoin and tolu and $\frac{1}{2}$ gram of olibanum to 1 litre of alcohol will give, in about one month, a perfectly de-odorised alcohol suitable for making verbena perfumes or eau-de-Cologne. Similarly, the addition of certain quantities of labdanum, orris, and Peru balsam will produce a spirit well adapted for the oriental type of bouquet. Ginger and opoponax added to the latter will make it heavier and warmer, while oakmoss and vetivert will alter the aroma slightly, so that the alcohol can be used satisfactorily for trèfle, foin coupé, and fougère.

Blending will, of course, depend upon the particular perfume which is in course of preparation, and, according to whether it is of floral or of fancy type, so will the range of bodies that may be used suggest themselves. For example, in *violet* perfumes, santal, costus, ylang ylang, and orris may be used ; in *lily of the valley* creations, bois de rose, ylang ylang, and hydroxy-citronellal can be employed ; in *carnation*, heliotropin, iso-eugenol, and benzyl iso-eugenol are useful, while for *fancy bouquets* almost any of the fixators can be introduced, providing their notes combine to form a perfect harmony. It is safe to say that for a large number of floral perfumes, the better-known bodies, such as coumarin, vanillin, and heliotropin, can nearly always be utilised, but it is pointed out that

traces of such articles as floranal and dimethyl-hydroquinone will materially improve the fragrance of the finished product and are in consequence more suited for "perfumes de luxe." The odorous resins of ambrette, angelica, patchouli, santal, and vetivert should not be overlooked, as they are excellent substitutes for their corresponding essential oils.

Final Fixation is probably the most delicate operation in preparing a good and distinctive perfume, as it is this part of the process which gives distinction and "life" to the finished product. This step really consists of three operations :—

(*a*) The addition of some animal perfume, such as small quantities of musk, civet, ambergris, or castor, which will impart "warmth and life" and at the same time improve the aroma by softening down the harshness caused by the presence of synthetics.

(*b*) The addition of a small quantity of a substance, such as verbena, bergamot, or bois de rose, which will produce a sweet and pleasant effect.

(*c*) The addition of a suitable quantity of natural absolute, having fresh and glowing characteristics such as jasmin, hyacinth, mimosa, or tuberose, which will give the predominating flowery note to a perfectly harmonious mixture.

The finished perfume should be neither too animal nor too chemical if these points have had careful consideration.

There is no definite rule that can be laid down for the choice of fixatives other than the general principle of complete harmony between the various constituents employed in any one perfume. Every chemist-perfumer has his own methods and frequently a comprehensive knowledge, acquired by practice, of a certain number of bodies which he is inclined to use as a base when building up all new creations. With a view to extending this list of fixatives, suggestions will be made later regarding the employment of some of the newer and more powerful bodies which it is hoped will be tried with good results. Before referring

to these it will perhaps be advisable to illustrate the general outline given above by an example of an exceptionally persistent fancy bouquet in concentrated form.

1. Take 1 litre of 90 per cent alcohol and add to it 20 grams of each benzoin R. and orris oleo-resin, 10 c.c. of balsam of Peru, and 5 c.c. of tincture of ginger. Allow the whole to mature for one month.

2. At the end of this period dissolve in the mixture 50 grams of coumarin, 30 grams of musk ambrette, and 20 grams of heliotropin. Stand aside for twenty-four hours after solution has been effected. The aroma of this compound will begin to assume "body" and some sweetness, but will not yet possess any distinctive characteristics. To improve the blend add 5 grams of each, ethyl cinnamate and dimethyl-hydroquinone.

3. To finally fix add (*a*) strong tincture of musk 10 c.c., to give warmth and to soften; (*b*) cayenne linaloe oil 20 c.c., terpeneless bergamot 20 c.c., to produce a sweet and pleasant effect; (*c*) rose otto 50 c.c., and tuberose absolute 125 c.c., to obtain a flowery odour. If the perfume has not enough "body" add a further 20 c.c. of patchouli or Canada snake root oil. The formula now reads :—

Tuberose absolute	125 c.c.
Rose otto	50 ,,
Patchouli oil (or Canada snake root oil)	20 ,,
Bergamot oil (terpeneless)	20 ,,
Cayenne linaloe oil	20 ,,
Musk extract soluble 10 per cent	10 ,,
Dimethyl-hydroquinone	5 grams
Ethyl cinnamate	5 c.c.
Musk ambrette	30 grams
Coumarin	50 ,,
Heliotropin	20 ,,
Tincture of ginger	5 c.c.
Balsam Peru	10 ,,
Orris oleo-resin	20 grams
Benzoin R.	20 ,,
Alcohol, 90 per cent	1000 c.c.

This perfume is equivalent to 720 *concentrate*, 35 grams of which added to 1 litre of alcohol will make a *triple extract.*

Before leaving the generalities of fixation it will perhaps be useful to append a list of classified odours (after Rümner).

Type.	Odours of the Same Class.
Almond . .	Laurel, mirbane.
Ambergris . .	Clary sage, cypress, labdanum
Anise . .	Aniseed, caraway, dill, fennel, coriander.
Balsamic . .	Vanilla, benzoin, Peru, tolu, storax, tonka bean, heliotrope.
Camphoraceous .	Camphor, patchouli, rosemary.
Caryophyllaceous	Clove pink, carnation.
Citrine . .	Bergamot, lemon, lime, orange, mandarin.
Fruity . .	Pear, apple, pineapple, peach.
Jasmine . .	Lily of the valley (muguet), ylang ylang.
Lavender . .	Aspic, thyme, marjoram.
Mint . . .	Peppermint, basil, sage (officinalis).
Musk . .	Musk, civet, ambrette, seed, various musk plants.
Orange Flower .	Neroli, acacia, syringa.
Rose . .	Geranium, eglantine.
Spicy . .	Cinnamon, nutmeg, mace, allspice.
Tuberose . .	Hyacinth, jonquille, lily, narcissus.
Violet . .	Cassie, iris, mignonette (reseda).

NATURAL FIXATIVES

Animal Fixators have been used by perfumers since antiquity, and to-day they may be said to constitute one of our most indispensable assets. Formerly they were added to mixtures of essential oils, flower pomades, and gum-resins, with a view to attenuating the odour and at the same time to give the perfume "life." Nowadays their employment is almost identical, excepting perhaps that the *form* in which they are used is more convenient. The discovery of artificial bodies of high melting and boiling-points has probably diminished their use to some extent, but it can never be argued that they have in any way *replaced* the animal fixators completely. Notable examples of these valuable synthetics are to be found in musk xylol, ketone and ambrette, indol and skatol, and artificial ambers,

but even when artistically employed along with gum-resins, essential oils, etc., they never give the "life" to a perfume that is attendant upon the use of animal fixatives. They do, however, make it possible to reduce the proportion of the latter class of bodies in any fragrant mixture, and at the same time tend to diminish the fugitive nature of the aroma. The most important bodies of animal origin are—ambergris, musk, civet, and castor. Their odours are of a type, yet they all possess distinct and different notes. Broadly, ambergris may be said to be earthy, musk pleasantly aromatic, civet disagreeable, and castor tarry. This, of course, applies to the raw material, and it is only in extreme dilution and after long maturing that a resemblance is apparent. In fancy bouquets and some flower bouquets a mixture of two or more of these bodies will give the best effects, while in other cases, one of them will blend with the predominating note of a perfume better than another. As an instance of this, civet is superior to castor for muguet flower perfumes, while ambergris is the best for old-fashioned eau-de-Colognes. On the other hand, a mixture of musk and civet in large proportions is most appreciated in perfumes of the oriental type. Formerly it was the custom to use these animal fixatives in the form of a tincture which in many cases was matured for years. Nowadays these methods are still used by some perfumers, but the application of science has made it possible to extract all the odoriferous principles in concentrated form and in a comparatively short space of time. In the Dictionary reference has been made to the fact that certain proportions of the animal product are soluble in alcohol or other volatile solvent, in water, and in alkaline solutions. By the application of these processes it is therefore possible to completely extract the odoriferous constituents, and at the same time eliminate the fat and other extraneous matter present in the crude raw material. In order that this process may have practical application the economic extraction of *musk* is given in some detail.

A pod of "blue pile" is taken and the grains re-

moved ; the outer skin being cut up into small pieces and the whole mixed intimately. This is transferred to a suitable receptacle containing a 5 per cent solution of glycerine in distilled water. It is macerated, with frequent shaking, for two days, when the clear supernatant liquid is poured off and reserved. The "bottoms" are again *twice* exhausted with a similar solution to which has been added traces of alkali. These solutions are then mixed and about 10 per cent of alcohol added as an additional preservative, the solution being stored in a perfectly air-tight vessel. The partially exhausted musk is now plunged into *otto of rose* or *clary sage oil* and heated to 60° C. for twenty-four hours. The marc is then pressed and afterwards reduced to a coarse powder, which is macerated in absolute alcohol for a week with frequent shaking. The alcoholic solution is filtered into the aqueous extract, and this constitutes a strong tincture in which the whole of the odoriferous principles of the musk pod are contained. If it is desired to retain the solution in a semi-weak state, it is advisable either to increase the alcohol to about 60 per cent strength or to add sufficient glycerine to make a 10 per cent solution. The addition of the latter will increase the solubility of the extract and also help to preserve it. These defatted animal extracts may be concentrated to 1 in 10 at a low temperature *in vacuo* without the loss of any of their odoriferous constituents, and in this form they are most useful for fixing floral ottos.

The weaker solutions are quite good for alcoholic perfumes, but it will be readily understood that their employment in "ottos" is not desirable, as they would have to be used in much larger proportion with a consequent diminution in strength of the final product. In alcoholic handkerchief perfumes the strong extracts may be used up to about 10 per cent of the *absolute essences* present, while in a floral otto as much as 20 per cent is sometimes necessary. In preparing an *ordinary* weak tincture of the animal fixator consideration must be given to the percentage of alcohol that will extract most of the odoriferous bodies, as, for example,

60 per cent alcohol for genuine tonquin musk. The addition of a weak alkali is sometimes advisable, as it helps to bring out the odour, and the carbonates of potash and ammonium are much used for this purpose. The following formula may be taken as a general indication of the proportions to use :—

Crude animal product . . .	5 grams
Alkali	1 gram
Alcohol of suitable strength . .	1000 c.c.

Note.—The lixiviation of the raw material is considerably facilitated by the employment of an equal weight of powdered orris root.

Vegetable Fixators have been in use since the dim ages of the pre-Christian era, as is shown by the references of ancient writers to such substances as myrrh, frankincense, and spikenard. Nowadays they constitute some of our most useful raw materials, as when mixed with other volatile substances, they possess the remarkable property of equalising their various rates of evaporation. The most important groups of these bodies are essential oils and balsams, gums or oleo-resins.

The majority of **Essential Oils** do not possess tenacious odours, but there are a few whose physical characteristics enable them to be classed as fixators. Among the more important members of this group are bois de rose, clary sage, orris, patchouli, santal, and vetivert. These oils have a very high boiling-point, and, in consequence, a slow rate of evaporation. When mixed with other more volatile bodies they prevent rapid evanescence, and produce a mixture having a tenacious odour—hence their inclusion in this class. It is not often that they are used for this purpose alone, as in the majority of cases they act rather as blenders than as fixators. This is well illustrated in the case of patchouli, for when this oil is added in traces to a synthetic rose base, it alters the odour very slightly, and the mixture recalls a bouquet of white roses rather than of

[*S.F.P.A.*

FIG. 34.—Cultivation of Clary Sage at Villeurbanne (Rhone) in July, 1922.

[*S.F.P.A.*

FIG. 35.—Another view of the extensive cultures at Villeurbanne (Rhone) in July, 1922.

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red roses, and at the same time the otto retains its odour for a much longer period when used. Any of the above-mentioned oils make excellent fixers for fancy perfumes ; for those of the sweet flowery type bois de rose and clary sage are excellent, for the violet type orris and santal are indispensable, while for the oriental bouquet it is difficult to find a more suitable *base* than either patchouli or vetivert. It is quite a common practice in the latter class of perfumes to make the mixture up entirely of fixatives, the bodies suitable for this purpose being well illustrated in the introductory remarks to this chapter.

The essential oil which is pre-eminent as a fixator for *any* perfume is unquestionably *Salvia sclarea*. The majority of floral ottos are made with synthetic aromatic chemicals, and they rarely compare favourably with the natural flower extract on account of their harshness. Those of finest quality are usually the result of the artistic union of synthetics with nature, in that as much as 10 per cent or more of the flower absolute is added during manufacture. The odour of the resulting product after one month is smoother and approximates more nearly to the natural flower, but the addition of $\frac{1}{2}$ to 2 per cent of clary sage oil will in *less than one month* give results which are unobtainable with any other material. The "chemical smell" during the first two or three days will become harsher, coarser, and less like the odour it is intended to imitate, but a peculiar sweetness and flower freshness will develop after one week until at the end of a month the synthetic will have lost its raw odour, and will have assumed a characteristic fragrance and a remarkable tenacity. As an example of these exceptional properties, the following formula for *trèfle de luxe* should be tried :—

Clary sage oil	100 c.c.
Iso-butyl salicylate	600 ,,
Ylang ylang oil, Manilla	100 ,,
Bergamot oil, terpeneless	60 ,,
Rose synthetic	50 ,,
Oakmoss resin, colourless	40 ,,
Phenyl acetic acid	10 grams
Vanillin	40 ,,

Clary sage oil is also invaluable as a blender and fixer in alcoholic perfumes, and particularly in toilet waters—*see* eau-de-Cologne.

It is used as a 5 per cent solution in alcohol, and from $\frac{1}{2}$ to 2 per cent of this solution is sufficient for fixing any fugitive flower bouquet.

Balsams, Gums, and **Oleo-resins.**—Many of these substances are employed as fixatives in different types of perfumes, and some slight reference to their constitution seems desirable here.

The average commercial sample consists of the natural plant exudation together with extraneous matter, which is of course removed as demonstrated below, but occurs with the substance, often owing to the very crude methods used during collection in its native country. The valuable portion of the material contains two different bodies—

(1) A small quantity of essential oil of characteristic odour, which can be separated by the usual methods if desired.

(2) A large proportion of soluble resin, miscible with the various basic perfume materials, and constituting the real fixator.

In order to obtain the active ingredients of this class of bodies in a form which can be easily handled and used with mathematical accuracy, one general and simple method is applied which is really more or less common in the drug trade. It consists of exhausting the crude material with ethyl alcohol, iso-propyl alcohol, petroleum ether, acetone, or other volatile solvent by means of maceration or percolation, and subsequent removal of the solvent by distillation at a low temperature, *in vacuo*. These bodies do not thereby lose any of their odoriferous constituents, but they represent all that is of value to the perfumer, and in a very convenient form. They are known as *resinodors*, *gomodors*, *clairs*, *R*, etc., and are represented by benzoin, cistus, olibanum, styrax, oakmoss, orris, Peru, copaiba, etc. These bodies are the most perfect fixators, and exact quantities can

be used always, which is a distinct advantage in the preparation of any perfume. It should be noted that when preparing them the strength of solvent used should correspond with the strength of alcohol, for example, in the finished perfume ; otherwise some of the constituents will be thrown out of solution, and filtration will become necessary. The quantity of "R." to be used in any perfume will vary according to the odour and the persistence desired ; for general use up to 1 per cent of *benzoin* is recommended for alcoholic perfumes. The aroma of this particular raw material is pleasant without being too characteristic, and it will blend so well that its odour will never be noticeable. On the contrary, styrax will blend better with hyacinth perfumes, olibanum with champaca cistus with verbena, oakmoss with trèfle, orris with violet, Peru with any perfume where warmth is desired, etc.

The proportion of "R." which is added to a *non-alcoholic* perfume is frequently high, and in the case of benzoin is sometimes as much as 30 per cent of the finished product. This is accounted for to some extent by its smooth and sweet odour, but those bodies, such as olibanum, labdanum, etc., whose odours are stronger will not exceed 5 to 10 per cent, and they are frequently used as weak as 1 per cent, if other fixators are present in the compound.

ARTIFICIAL FIXATIVES

The very wide range of **Synthetic Aromatic Chemicals** from which many valuable fixatives can be chosen is due to much patient research on the part of chemists. Up to a few years ago the only synthetics which were well known and largely employed were coumarin, vanillin, heliotropin, and musk Baur, and as every chemist-perfumer is familiar with their properties and uses, it will not be necessary to give any details here. It seems desirable, however, that some reference should be made to other important fixative bodies, as every worker is on the look-out for new synthetics which will enable him to create new perfumes of

perfect tenacity. Among the acids a very important and cheap article is *phenylacetic acid*. It occurs naturally in several flowers or flower extracts—for example, orange flower and the rose. Its odour recalls civet, and when used in small quantities it produces a pleasant and cooling persistence. It should not be used in large quantities, otherwise a very objectionable effect will be produced in the same way as an excess of castor. Another cheap synthetic of weak odour is *benzoic acid*. It will blend well with any perfume, and its odour will not be noticeable. A better fixative than this is *cinnamic acid*, which occurs in benzoin and tolu, and from which raw materials it may be extracted. The *alcohol* and *esters* are, however, much more persistent, and in consequence more popular, especially in the preparation of amber Colognes and lavender waters. Among the esters, ketones, etc., we have a large choice ; a comparatively cheap article of amber odour is *amyl benzoate*. This can be used in all types of artificial ambers, and is a good base for ottos of oriental type. *Benzophenone* is a valuable crystalline fixative of pleasant odour that can be used in almost any sweet floral bouquet. *Benzylidene acetone* is a solid with a delightful flower odour, and even in traces is remarkably persistent. *Benzyl iso-eugenol* has a great future. It is expensive, but nothing can replace it as a fixer for carnation or clove pink, while traces in synthetic rose are invaluable. *p-Cresol methyl ether* in the pure state is not exactly pleasant, but in extreme dilution it will stabilise both wallflower and narcissus perfumes. *Diphenyl methane* and *diphenyl oxide* have a sweet geranium odour and can well be used in perfumes of that type. *Dimethyl hydroquinone* has an odour of melilot, and with coumarin and musk ambrette will fix foin coupé perfumes. *Ethyl phthalate* possesses little odour, but is a good solvent, and will give persistence to almost any type of perfume. *Floranal* should be tried in the violet type of floral otto, and it will then need no further recommendation. *Hydroxy-citronellal* is probably the most recent addition to the list of synthetics, and owing to its high boiling-point is difficult of evaporation. It has a lily

odour and can be employed in all sweet flowery perfumes. *Iso-butyl benzoate* is of the neroli type, and it will be found useful as a fixative in synthetic orange flower bouquets. *Phenyl cresyl oxide* is a crystalline body of delightfully fresh, powerful, and persistent odour. It deserves much more notice than it receives. *Piperonal vanillone* is one of the newer heliotropin condensation products with vanillin. It has a sweeter and more powerful odour than either of these bodies, and when better known will have a very wide employment. *Skatol*, like *indol*, is objectionable in a concentrated form, but in dilution will be found useful in place of civet. *Styrone* is a valuable fixer for the hyacinth type of perfume. *Methyl naphthyl ketone* is a useful crystalline fixative for Colognes, but should be employed in small quantities only. This list is capable of much extension, but a complete classification of fixatives will be found towards the end of this chapter. The quantity of any synthetic fixer or blender will require to be carefully added in order to prevent any suggestion of a chemical smell. A good plan is to use an equal weight of balsam or gum-resin to obtain more perfect balance. In order to avoid the possibility of spoiling a perfume by the injudicious addition of synthetic fixatives many manufacturers keep a series of perhaps half a dozen **Compounds**, consisting of animal, vegetable, and synthetic fixators, suitably blended, and each having a distinct floral note produced by the addition of a small quantity of flower extract. A most important branch of this series is to be found in the so-called *synthetic ambers*. They are all of a musky tendency and are particularly useful for any type of fancy bouquet; up to 1 per cent may be used in any alcoholic handkerchief perfume, while as much as 20 per cent can be added to a concentrated floral otto.

The following formulæ for **Liquid Ambers** may be endlessly modified to suit individual tastes :—

A.

Musk extract natural 10 per cent	500 c.c.
Civet „ „ 10 „	175 „
Castor „ „ 10 „	100 „
Musk ambrette	50 grams
Clary sage oil	25 c.c.
Rose otto virgin	25 „
Cistus R.	25 „
Benzoin R.	100 „

B.

Civet extract natural 10 per cent	400 c.c.
Musk „ „ 10 „	200 „
Musk ketone	50 grams
Phenylacetic acid	25 „
Vanillin	50 „
Jasmin absolute	25 c.c.
Dimethyl hydroquinone	25 grams
Balsam Peru	100 c.c.
Ambrette oil	25 „
Amyl benzoate	100 „

C.

Musk extract natural 10 per cent	300 c.c.
Castor „ „ 10 „	200 „
Clary sage oil	50 „
Coumarin	100 grams
Benzyl iso-eugenol	100 „
Oakmoss resin	25 c.c.
Tolu R.	100 „
Methyl paratolyl ketone	25 „
Ethyl phthalate	100 „

D.

Musk extract natural 10 per cent	400 c.c.
Ambergris tincture	200 „
Labdanum R.	100 „
Cypress oil	25 „
Iso-butyl benzoate	75 „
Heliotropin-amorphous	50 grams
Benzyl benzoate	50 c.c.
Benzoin R.	100 „

The next series of formulæ will indicate the lines on which special **Floral Fixators** may be compounded. They possess a fresher and more characteristic odour than

the *ambers*, and the flower perfume can be built up from them quite easily :—

Roseophyx.

Rosindol	100 grams
Cayenne linaloe oil	125 c.c.
Patchouli oil—English	25 „
Vetivert oil—English	25 „
Diphenyl oxide	25 grams
Styrax R.	50 c.c.
Bulgarian rose otto	50 „
Benzyl iso-eugenol	100 grams
Benzoin R.	100 c.c.
Ethyl phthalate	400 „

Œilletophyx.

Benzyl iso-eugenol	300 grams
Musk ambrette	50 „
Heliotropin	100 „
Cistus R.	50 c.c.
Vanillin	100 grams
Œillet absolute	50 c.c.
Benzoin R.	350 „

Violettophyx.

Orris oleo-resin	100 c.c.
Ambrette oil	30 „
Floranal	50 grams
Ethyl myristinate	20 c.c.
Coumarin	150 grams
Vanillin	50 „
Musk ambrette	100 „
Benzyl iso-eugenol	150 „
Violet victoria absolute	50 c.c.
Tolu R.	100 „
Labdanum R.	50 „
Benzoin R.	150 „

Jasmaphyx.

Indol	50 grams
Benzyl formate	50 c.c.
Tolu R.	200 „
Peru R.	100 „
Floranal	50 grams
Jasmin absolute	50 c.c.
Benzoin R.	200 „
Hydroxy-citronellal	100 „
Benzyl propionate	200 „

The following two formulæ will make suitable **Oriental Fixators**:—

Luxorania.

Myrrh R.	200 c.c.
Olibanum R.	50 „
Cistus R.	100 „
Balsam Peru	200 „
Tolu R.	50 „
Ethyl cinnamate	50 „
Patchouli oil, terpeneless	25 „
Vetivert oil, terpeneless	25 „
Coumarin	50 grams
Musk ambrette	50 „
Civet extract natural 10 per cent	100 c.c.
Musk „ „ 10 „	100 „

Luxoranthia.

Rosindol	50 grams
Floranal	50 „
Geranium R.	150 c.c.
Benzyl cinnamate	50 „
Piperonal-vanillone	150 grams
Musk ketone	100 „
Amber liquid A.	400 c.c.
Phenyl-cresyl oxide	30 grams
Anisic aldehyde	20 c.c.

The two compounds indicated below are useful as **Toilet Water Fixators**:—

Lavendex.

Vanillin	50 grams
Sylvanol	100 „
Musk ambrette	50 „
Musk natural extract 10 per cent	200 c.c.
Vetivert oil	25 „
Nutmeg oil	25 „
Lavender oil—English	50 „
Ethyl phthalate	500 „

Colognez.

Benzyl iso-eugenol	100 grams
Ethyl cinnamate	50 c.c.
Methyl naphthyl ketone	50 grams
Cinnamic alcohol	100 c.c.
Salvia sclarea oil	50 „
Petitgrain oil, terpeneless—French	150 „
Iso-butyl benzoate	500 „

It should be remembered that any compound fixator must be as near perfection as possible, owing to the preference the present-day public have for a perfume that will "hold," and in many cases it is necessary for *half* the otto to consist of fixator. In compounding alcoholic perfumes it is advisable to mix the compound fixator with the absolute essences and allow the mixture to blend a few days before adding the spirit. A good process for the manufacture of persistent odoriferous fancy floral ottos is to build them up with the fixator as the base. One takes, for example, one part of roseophyx, to which one adds two parts of unfixed jasmin, when a very persistent perfume results. By the further addition of one part of amber liquid B. and two parts of muguet or tuberose one obtains a delightful flower bouquet of great tenacity.

CLASSIFICATION OF FIXATORS.

1. *Essential Oils.*

Basil.
Bois de rose.
Cananga.
Cedar wood.
Cassia.
Clove.
Coriander.
Costus.
Cumin.
Cypress.
Guaiac wood.
Iris.
Linaloe.
Marjoram.
Myrtle.
Mace.
Nutmeg.[1]
Origanum.
Patchouli.
Peru.
Salvia sclarea.
Santal.
Sassafras.
Spikenard.
Sumbul.
Saffron.
Tarragon.
Thuja.
Thyme.
Valerian.
Vetivert.
Ylang-ylang.

[1] Expressed.

2. *Balsams, Gums, Oleo-Resins, etc.*

Ambrette.
Angelica.
Asafœtida.
Benzoin.
Camomile.
Cistus.
Clove.
Copaiba.
Elemi.
Galbanum.
Geranium.
Ginger.
Iris.
Juniper.
Labdanum.
Male fern.
Mastic.
Moss—Corsican.
Myrrh.
Olibanum.
Opoponax.
Oakmoss.
Patchouli.
Peru.
Santal.
Sumbul.
Storax.
Sandarac.
Tolu.
Tonka beans.
Vetivert.
Vanilla.

3. *Synthetic Aromatic Chemicals.*

Acetyl iso-eugenol.
Amyl benzoate.
Benzoic acid.
Benzophenone.
Benzyl benzoate.
Benzyl cinnamate.
Benzylidene acetone.
Benzyl iso-eugenol.
Beta naphthol ethers.
Cinnamic acid.
Cinnamyl cinnamate.
Coumarin.
p-Cresol methyl ether.
Cedrol.
Diphenyl methane.
Diphenyl oxide.
Dimethyl hydroquinone.
Ethyl cinnamate.
Ethyl myristinate.
Ethyl phthalate.
Floranal.
Fragarol.
Fixol.
Heliotropin.
Hydroxy-citronellal.
Irenia-alpha and beta.
Iso-butyl cinnamate.
Iso-butyl benzoate.
Methyl cinnamate.
Methyl ionate and iridate.
Methyl naphthyl ketone.
Musks—artificial—various.
Nerolin.
Phenylacetic acid.
Phenyl-propyl-cinnamate.
Piperonal-vanillone.
Para-methyl hydrocinnamic aldehyde.
Phenyl-cresyl oxide.
Rosindol.
Santalol.
Safrole.
Styrone.
Sylvanol.
Terpinyl cinnamate.
Tetrahydro para-methyl quinoline.
Vanillin.
Yara-yara.

FLOWER PERFUME FIXATORS—CLASSIFIED.

The following tabulation is intended to assist those who are desirous of obtaining the best fixatives for flower perfumes :—

Acacia.—Bois de rose, myrrh, Peru, tolu, musks, civet vanillin, rosindol, hydroxy-citronellal.

Broom.—Musks, olibanum, sumbul, vetivert, *p*-cresol methyl ether.

Carnation.—Œilletophyx, benzyl iso-eugenol, piperonal-vanillone, ambrette, benzoin, labdanum, musks, clary sage.

Cassie.—Violettophyx, orris oleo-resin, floranal, styrax, costus, coumarin, vanillin, tolu, methyl naphthyl ketone.

Champaca.—Benzyl iso-eugenol, ambrette, olibanum, ylang-ylang, tolu, vanilla, musk natural, cinnamyl cinnamate.

Cologne.—Colognez, clary sage, benzyl iso-eugenol, ethyl cinnamate, β-naphthol ethers, benzoin, ambergris, musk natural.

Corylopsis.—Bois de rose, roseophyx, rosindol, civet, floranal, oleo-resin orris, violettophyx, ambrette, vanillin.

Fern.—Oakmoss resin, vanillin, benzyl iso-eugenol, coumarin, dimethyl hydroquinone.

Hawthorn.—Benzoin, bois de rose, costus, styrax, vetivert, hydroxy-citronellal.

Heather.—Elemi, olibanum, floranal, benzoin.

Heliotrope.—Piperonal-vanillone, benzoin, Peru balsam, tolu.

Honeysuckle.—Mastic, bois de rose, tolu, olibanum, vanillin, hydroxy-citronellal.

Hyacinth.—Benzoin, cistus, costus, cinnamic alcohol, bois de rose, labdanum, musks.

Jasmin.—Indol, jasmaphyx, Peru, tolu, styrone, floranal, costus, hydroxy-citronellal, civet.

Jonquille.—Benzoin, bois de rose, vanillin, basil, patchouli.

Lavender.—Mastic, musk, amber liquid, styrax, lavendex.

Lilac.—Hydroxy-citronellal, bois de rose, vanillin, floranal, tolu, ambergris, Peru balsam, benzoin, phenyl-cresyl oxide.

Lime or **Linden.**—Hydroxy-citronellal, benzoin, musk ketone, mastic, tolu, ambrette.

Magnolia.—Balsam Peru, benzylidene acetone, amber liquid, styrax, civet, mus knatural, mastic, benzyl iso-eugenol.

Mimosa.—Cinnamic alcohol, Peru, mastic, tolu, musks, violettophyx.

Muguet.—Hydroxy-citronellal, benzoin, civet, floranal, bois de rose.

Narcissus.—*p*-Cresyl phenylacetate, benzoin, labdanum, costus, musks.

New-Mown Hay.—Floranal, coumarin, oakmoss, thuja, dimethyl hydroquinone, clary sage, phenyl-cresyl oxide, diphenyl methane, diphenyl oxide.

Night Scented Stock.—Piperonal-vanillone, benzoin, Peru balsam, tolu, styrax, floranal, benzyl iso-eugenol, clary sage.

Orchids.—Oakmoss, benzoin, Peru, musk, vanillin, ylang-ylang, coumarin, phenylacetic acid.

Orange Flowers.—Musks, benzoin, mastic, olibanum, tolu, Peru, indol, iso-butyl benzoate, methyl naphthyl ketone.

Reseda. — Violettophyx, orris, labdanum, costus, styrax, basil.

Rose.—Roseophyx, vetivert, patchouli, rosindol, styrax, santal, hydroxy-citronellal, bois de rose.

Sweet Pea.—Benzylidene acetone, iso-butyl phenacetate, tolu, Peru, hydroxy-citronellal, mastic, heliotropin, musks.

Sweet Briar.—Rosindol, benzoin, civet, bois de rose, styrax.

Trèfle.—Clary sage, cananga, benzyl iso-eugenol, oakmoss, benzoin, Peru, dimethyl hydroquinone.

Tuberose.—Peru balsam, rosindol, floranal.

Verbena.—Cistus, elemi, copaiba, benzoin, styrax, vanillin, olibanum, orris oleo-resin, heliotropin.

Violet.—Violettophyx, floranal, oleo-resin orris, ambrette, ylang-ylang, vanillin, benzyl iso-eugenol, costus.

Wallflower.—Benzoin, benzyl iso-eugenol, *p*-cresyl-methyl ether, cistus, musks.

CHAPTER III.

MONOGRAPHS ON FLOWER PERFUMES.

ACACIA.

Acacia is the name of an extensive genus of trees and shrubs of the N.O. Leguminosæ, varying in habit from heath-like shrubs to lofty trees, and widely spread throughout the tropical and sub-tropical regions of both hemispheres. The inflorescences take the form of compact globose heads or spikes of various colours, generally white, pink, or yellow, the latter being the predominant colour in the Australian species.

Varieties.—In India the genus is represented by about eighteen species of trees of various sizes, distributed throughout the country, some attaining a height of 100 ft., especially in the forests of Pegu and Prome. In Western Asia and Africa the genus is represented by gum-yielding species, such as *A. Arabica* and *A. Senegal*, which are small-sized, thorny trees of forbidding aspect and frequently occupying large tracts of desert country. Other species of acacia are also common in the West Indies and tropical America, where they are valued for their timber. In Australia this genus is profuse, and as many as 300 different species are recorded, several of which are of great commercial value as the bark is used for tanning. Among the more important of these are *Acacia decurrens*, known as the black wattle in Victoria and Tasmania; *A. dealbata*,[1] the silver wattle; and *A. pycnantha*, the broad-leaf wattle. In Southern Europe and

[1] *See also* Mimosa.

Western Syria the genus is represented by *A. Julibrissin* and *A. Farnesiana*.[1]

Odour.—Several acacias possess sweet-scented flowers, and of these (with the exception of *A. Farnesiana* and *A. dealbata*, which will be dealt with in separate monographs) the more important are *A. biflora* and *A. hastulata*. The odour of the former recalls the cocoanut, while that of the latter resembles hawthorn, but as far as is known neither have been turned to practical account for the extraction of their perfume in Europe. In Australia, however, there is a perfume known as "wattle blossom," obtained from the flowers, collected after sundown. It is prepared by macerating them in olive oil, which when saturated is extracted with strong alcohol.

Synthetic Otto.—Aubepine is the basis of all artificial acacia perfumes, and this is supplemented by the addition of jasmin, rose, and neroli, the mixture being fixed with musk or any of the other bodies mentioned in the classified list. Special floral notes are obtainable by the addition of mere traces of aldehydes C_{14} and C_{16}, which on first addition seem to completely disappear. They develop quite satisfactorily, however, after the compound has been left to mature for about one month, and on this account should be used with discretion.

Variations may be obtained by the use of: Phenylacetic aldehyde, methyl anthranilate, iso-butyl benzoate, linalol, and beta naphthol methyl ether.

The formulæ given below will illustrate these modifications:—

Acacia.

A.

Anisic aldehyde	550 c.c.
Phenylacetic aldehyde . . .	50 „
Rose synthetic	45 „
Jasmin extra	55 „

[1] *See also* Cassie.

A. *continued.*

Methyl anthranilate	100	c.c.
Iso-butyl benzoate	80	,,
Musk ketone	20	grams
Bois de rose oil, femelle	100	c.c.
Aldehyde C_{14}	0·5	,,

B.

Anisic aldehyde	600	c.c.
Cinnamic alcohol	50	,,
Petitgrain oil, terpeneless	100	,,
Iso-butyl phenylacetate	50	,,
Rhodinol	20	,,
Benzyl acetate	30	,,
Linalol	20	,,
Hydroxy-citronellal	20	,,
Myrrh R.	60	,,
Vanillin	50	grams
Aldehyde C_{16}	0·5	c.c.

Handkerchief Perfumes can be made from either of the foregoing as follows :—

C.

Acacia synthetic	40	c.c.
Musk extract soluble 10 per cent	10	,,
Alcohol—to produce	1000	,,

D.

Acacia synthetic	30	c.c.
Civet extract soluble 10 per cent	2	,,
Jasmin extract triple	100	,,
Rose ,, ,,	150	,,
Benzoin R.	3	,,
Alcohol—to produce	1000	,,

CARNATION.

History.—The Greek philosopher Theophrastus, in his "Enquiry into Plants," VI., 6, 2, states that the gillyflower, (? stock) is sweet-scented, but that the carnation and wall-flower are *scentless*, from which it is evident that this flower was known in the fourth century B.C. The carnation is stated to have been a very much favoured flower in the time

of Queen Elizabeth, and in later years the poet William Shenstone wrote of it as follows :—

> "Let your admired carnation own,
> Not all for needful use alone;
> There while the seeds of future blossoms dwell,
> 'Tis coloured for the sight, perfumed to please the smell."

The clove pink, *Dianthus caryophyllus*, of which the carnation is a variety, is a grass-leaved herbaceous plant of the N.O. Caryophyllaceæ. The origin of the name "clove" is worthy of mention. It is derived from the French word *clou*, English "clout," a nail, from the imaginary resemblance of the clove flower to the head of a nail. Tournefort, a French botanist who died in 1708, is supposed to have given it the specific name *Caryophyllus* on account of its similarity to some of the short-leaved species of the genus *Carex* and its allies. The word *Caryophyllus* is also applied to the molucca clove, although there is no likeness between the two; nevertheless Tournefort's name of *Caryophyllus aromaticus* was adopted by early botanists for this well-known spice. This consists of the dried, unexpanded flower-buds of a tree of the N.O. Myrtaceæ, which is now known as *Eugenia caryophyllata*.

Varieties.—There are over fifty species of *Dianthus*, with numerous varieties, including carnations, pinks, picotees, and sweet-williams. These are grouped according to the markings of the flower as follows :—

Bizarres—spotted or striped with several shades (usually three).

Fancies—with markings on coloured grounds.

Flakes—of two colours, striped longitudinally.

Picotees—with tinted petal edges.

Selfs—of one colour.

Odour.—The carnation has developed its rich, spicy odour with cultivation, although it is a peculiar fact that horticulture is responsible for many beautiful forms which are almost devoid of perfume. In the wild state it seldom

possesses either of these qualities, and is occasionally found growing on dry soil.

Natural Perfume.—This is usually extracted in the form of pomade and occasionally as concrete by means of volatile solvents. The pink and red and yellow and red varieties are especially cultivated in the south of France, and the harvest takes place in April. The flowers are picked after exposure to about three hours' brilliant sunshine, when their perfume is at its maximum fragrance.

The absolute flower oil is not much used on account of its high price, and handkerchief perfumes are usually compounded with the extract made from pomade.

Synthetic Otto.—There are many carnation oils on the market, and most of them are compounded exclusively from synthetics, although an exact reproduction of the perfume is at present impossible without the use of some natural concrete—up to 10 per cent. The basis of all artificial ottos is iso-eugenol, and this frequently represents 60 per cent of the total. Another body of recent introduction is hexyl methyl ketone, and the addition of some of it to the foregoing improves the odour. The best blends are obtained by the employment of rose, neroli, ylang-ylang, and heliotropin, or for preference *Piperonal-vanillone*, while the fixation of the otto is completed by the addition of about 10 per cent of benzyl iso-eugenol. This article does not appear to be well known, but it is a product that will command a great use in the near future, and if it is not available, benzoin or any of the other listed fixatives may be used in its place. Many pleasant variations may be obtained with eugenol, iso-butyl phenylacetate, nerol, amyl salicylate, and terpineol, and it is surprising what delightful effects are produced by traces of phenylacetic aldehyde or benzyl acetate. The following formulæ will illustrate these modifications :—

[*Photo, Parfumerie Moderne, Lyon.*

Fig. 36.—The cultivation of Carnations in flower at Carquieraine (Var.).

[*Photo, Parfumerie Moderne, Lyon.*

Fig. 37.—Carnations—ventilation of the same cultures in January, 1923.

[*To face page* 208.

Carnation.

A.

Iso-eugenol	600 c.c.
Piperonal-vanillone	60 grams
Rose otto virgin	20 c.c.
Petitgrain oil, terpeneless	20 „
Ylang-ylang oil—Manilla	20 „
Hydroxy-citronellal	20 „
Terpineol	20 „
Iso-butyl phenacetate	40 „
Benzyl iso-eugenol	100 grams
Carnation-absolute	100 c.c.

B.

Iso-eugenol	500 c.c.
Pimento oil, terpeneless	25 „
Canella oil	25 „
Nerol	60 „
Amyl salicylate	20 „
Hexyl methyl ketone	120 „
Cananga oil, terpeneless	20 „
Heliotropin	50 grams
Coumarin	20 „
Vanillin	20 „
Aldehyde C_{10}	10 c.c.
Clary sage oil	10 „
Musk ketone	20 grams
Benzoin R.	100 c.c.

Alcoholic Perfumes are, as stated above, best made from the triple extract—an example of each kind is, however, appended :—

C.

Carnation synthetic "A"	25 c.c.
Musk soluble 10 per cent	3 „
Benzoin R.	2 „
Alcohol	1000 „

D.

Rose oil—Bulgarian	0·5 c.c.
Neroli oil—Bigarade	2 „
Ylang-ylang oil—Manilla	0·5 „
Œilletophyx	5 „
Tincture of musk	12 „
Jasmin triple extract	100 „
Carnation triple extract	900 „

CASSIE.

History.—*Acacia Farnesiana* is a small tree whose origin appears to be uncertain. It is said to be a native of San Domingo and became naturalised in Europe about 1656, but this is probably incorrect since it is referred to by the author of a book published in Rome in 1625, entitled "Albini Hort. Farnesiana." About 1764 Linnæus, in "Hort. Upsalensis," described and named it *Mimosa Farnesiana*, which was afterwards, by Willdenow (1805), placed in his genus *Acacia*.

Varieties.—The trees cultivated for the extraction of their perfumes are *Acacia Farnesiana*, *A. bertoloni*, a native of Chili, and *A. lophantha*, an Australian species. A peculiarity of *A. Farnesiana* is that it grows abundantly in Syria, near Beyrouth, where a factory for the extraction of its perfume has been recently established. It is said that the wild plant is sometimes found covered with a parasite (*Lauranthus acacia*), which has lovely scarlet flowers in such profusion as at a distance to give to the trees the appearance of being on fire. Cassie is cultivated at Grasse and Cannes, where the young plants are raised from seeds. About the third year they are grafted and transplanted to the open fields, plenty of sun and shelter from the cold winds being necessary for their development. They grow to a height of about 15 feet, and the blossoms are successive, some being ready for collection before others are scarcely formed. The flowers are gathered twice a week in the daytime, and are conveyed to the works in the evening—the yield of blossoms per tree being about 2 lb.

Odour.—The three species mentioned above bear golden globular flowers, whose perfume closely resembles a perfectly blended combination of orange blossom and violet with just a mere suggestion of cummin.

Natural Perfume.—Cassie flowers are extracted by means of hot fats or by volatile solvents, and the essential

[*Photo, Parfumerie Moderne, Lyon.*

FIG. 38.—An Algerian Cassie Tree.

[*To face page* 210.

oil obtained from these products has been analysed. The following constituents are known[1] :—

Methyl salicylate.
Benzyl alcohol.
Farnesol.
Linalol.
Geraniol.
Anisaldehyde.
Benzaldehyde.
Cuminic aldehyde
Decyl aldehyde.

Traces of *p*-cresol exist and also two undefined ketones, one resembling menthone and the other having an odour recalling violet.

According to A. Ruppin,[2] the flowers cultivated in Syria are not extracted by the above method, but the floral odours are absorbed by means of plates of spermaceti which are sent to France to be worked up into perfumes.

The best results in practical perfumery are obtained by the use of cassie concrete *soluble*, which enters largely into the preparation of numerous violet bouquets, and to these it imparts a delightful and peculiar fragrance unobtainable with any other product. In this connection it should be noted that when compounding synthetic violet ottos, the use of some natural violet absolute is recommended, but owing to its prohibitive cost something cheaper often has to be found to replace it. Cassie concrete soluble is a good substitute, and from 5 to 10 per cent may be used with satisfactory results.

Synthetic Otto.—An artificial cassie may easily be built up from the known constituents mentioned above, but great care must be taken in the use of methyl salicylate, and the proportion should not exceed 25 per cent. This

[1] Gildemeister and Hoffmann, "Volatile Oils," II., 590.
[2] Schimmel's "Report" (1917), 106.

synthetic can be advantageously replaced by iso-butyl salicylate, which is now easily obtainable. The aldehydes are all used in small proportions, and several pleasant modifications can be made by the employment of duodecyclic aldehyde. Of the violet-smelling ketones irone is best, then methyl ionone, and lastly beta ionone. Geraniol, benzyl alcohol, and linalol make excellent bases for the otto, and traces of their *butyrates* will assist in producing odours having a close resemblance to the natural product. A very pleasant floral note may be struck by the use of para-methyl acetophenone (traces), and the suggestion of orange blossom can, of course, be obtained with methyl anthranilate. Fixation may be accomplished with oleo-resin orris, violettophyx, or any of the other bodies outlined in the classified list, and the complete rounding off of the odour can be attained by the addition of 10 per cent of cassie absolute (when best results are desired).

Cassie.

A.

Benzyl alcohol	250 c.c.	
Geraniol	80 „	
Linalol	120 „	
Iso-butyl salicylate	200 „	
Anisic aldehyde	40 „	
Irone	80 „	
Aldehyde C_{12}	5 „	
Methyl anthranilate	50 „	(melted)
Methyl acetophenone	5 „	
Violettophyx	60 „	
Cassie absolute	100 „	
Cuminic aldehyde	10 „	

B.

Methyl salicylate	240 c.c.	
Beta ionone	120 „	
Orris oil, concrete	40 grams	
Benzyl alcohol	200 c.c.	
Bois de rose oil	75 „	
Cummin oil	5 „	
Anisic aldehyde	50 „	

B. *continued.*

Petitgrain oil, terpeneless	75 c.c.
Palmarosa oil	80 „
Rhodinyl butrate	5 „
Aldehyde C_{10}	10 „
Orris oleo-resin	25 „
Coumarin	25 grams
Styrax R.	50 „

Alcoholic Perfumes are seldom made from the synthetic ottos. They are more often direct washings from pomade. Two formulæ are submitted :—

C.

Cassie synthetic "A"	30 c.c.
Civet extract soluble 10 per cent	3 „
Orange flower water triple	60 „
Alcohol 90 per cent	900 „

D.

Neroli oil bigarade extra	1 c.c.
Rose oil—Provence	2 „
Jasmin extract triple	200 „
Musk soluble 10 per cent	2 „
Civet „ 10 „	1 „
Vanillin	1 gram
Cassie extract triple—to produce	1000 c.c.

HAWTHORN.

History.—May blossom, *Cratægus oxycantha*, of the N.O. Rosaceæ, has been known since the earliest times, and was mentioned by Theophrastus as growing on Mount Ida. May Day has for years been one of our rural festivals, and many a pretty scene must have been enacted in London during the time of Robin Hood and Friar Tuck, for we are told[1] that the doors were decked with hawthorn and that fantastic dancers performed their antics round the maypole. There was so much enthusiasm at this period that young men and maidens went to the fields at sunrise to wash their faces in the dew and gather the treasured may.

[1] Donald McDonald, "Fragrant Flowers and Leaves" (1895), 33.

Varieties.—There are about forty species of this attractive family of shrubby trees, which are widely spread over both hemispheres. The height attained by them is about 20 feet, and they live to a great age. The main floral distinctions are colour and single or double flowers, while there is also a variation in the tint of the fruits. The common white-may of our English hedgerows is the most fragrant, and is not approached by the variety with scarlet flowers, which occasionally emit a disagreeable odour. The early spring variety, sometimes called the glastonbury thorn, is known to have flowered just after Christmas, when the atmospheric conditions have been favourable. Another species, *C. aronia*, is common in Palestine, and particularly near Jerusalem, where its red, fleshy fruits are collected for preserves.

Odour.—The exquisite fragrance of the hawthorn is so well known that it requires very little comment. The odour is spicy and recalls that of almonds. The natural perfume is not an article of commerce.

Synthetic Otto.—The perfume of may blossom is well represented by anisaldehyde, and to a lesser extent by acetophenone. The former can be used up to 75 per cent in any composition, but the latter should not exceed about one-seventh of that amount. It is usual to combine both with a natural isolate of rose odour such as geraniol, and the almondy note is obtained by the use of benzaldehyde or methyl paratolyl ketone. Special floral notes are produced by the addition of jasmin and orange flower, while fixation is effected by utilising piperonal-vanillone, coumarin, benzoin, styrax, or dimethyl hydroquinone. Two formulæ follow :—

Hawthorn Blossom.

A.

Anisic aldehyde	500 c.c.
Acetophenone	50 „
Geraniol from palmarosa oil . .	100 „

A. *continued.*

Piperonal-vanillone	50 grams
Dimethyl hydroquinone	10 „
Benzaldehyde (f.f.c.)	1 c.c.
Jasmin synthetic	100 „
Petitgrain oil, terpeneless—French	30 „
Cassie absolute	50 „
Benzoin R.	100 „
Alcohol C_9	9 „

May Blossom.

B.

Aubepine	500 c.c.
Heliotropin	30 grams
Coumarin	50 „
Methyl paratolyl ketone	20 c.c.
Orange flower absolute	100 „
Jasmin concrete	50 grams
Orris liquid	50 c.c.
Rose synthetic	100 „
Styrax R.	100 „

Alcoholic Perfumes may be prepared from the foregoing as follows :—

C.

Hawthorn blossom "A"	40 c.c.
Jasmin extract triple	100 „
Tuberose „ „	100 „
Amber liquid	10 „
Alcohol—to produce	1000 „

D.

May blossom "B"	28 c.c.
Jonquille extract triple	100 „
Neroli oil	1 „
Civet extract soluble 10 per cent	5 „
Musk „ „ 10 „	5 „
Essential oil of almonds—S.A.P.	1 „
Jasmin triple extract—to produce	1000 „

HELIOTROPE.

History.—Reference is made to this plant by many ancient writers among whom we may mention Theophrastus and Ovid. We are told by the former that it bloomed for

a long period, and that the time of its flowering depended upon the heavenly bodies. The plant was supposed to have owed its existence to the death of Clytie, who pined away in hopeless love of the god Phœbus (Apollo), and the latter (Ovid) alludes to this in the following lines ("Metamorphoses," Book IV., 255-270) :—

"But Clytie, though love could excuse her grief, and grief her tattling, was sought no more by the great light-giver (Apollo), nor did he find aught to love in her.

"For this cause she pined away, her love turned to madness. Unable to endure her sister nymphs, beneath the open sky, by night and day, she sat upon the ground, naked, bareheaded, unkempt.

"For nine whole days she sat, tasting neither drink nor food, her hunger fed by naught save her falling tears, and moved not from the ground.

"Only she gazed on the face of her god as he went his way, and turned her face towards him.

"They say that her limbs grew fast to the soil, and her deathly pallor changed in part to a bloodless plant ; but in part 'twas red, and a flower, much like a violet, came where her face had been. Still, though roots hold her fast, she turns ever towards the sun and, though changed herself, preserves her love unchanged."

The plant, whose flowers emit the most delightful fragrance, is *Heliotropium Peruvianum*, belonging to the N.O. Boraginaceæ. It is a native of Peru, and was introduced into Europe about 1757.

Varieties.—The genus *Heliotropium* contains about 90 species, of which the majority are botanically identified. They are distributed over the tropical and sub-tropical regions of both hemispheres and many are found growing in Europe. The species mentioned above is a favourite for greenhouse cultivation in this country, and the small clusters of its lavender-coloured flowers emit a delightful fragrance, which is somewhat almondy and inclined to be heavy. It is known by a variety of names, including

heliotrope, cherry-pie, and Peruvian turnsole, the latter from the ancient fancy that it turned with the sun (*see* Ovid's reference to this above). This plant should not be confused with *Chrozophora tinctoria*, an annual of the N.O. Euphorbiaceæ and native of southern Europe, where it is cultivated for the sake of a dye called *Turnsole*. The varieties of heliotrope include the following :—

The Queen, flowers almost white.

Bouquet de Violettes, blooms of different shades of blue.

Bouquet Parfumé, flowers lilac-blue.

Winter heliotrope, *Tussilago fragrans*, is a native of southern Europe and blossoms early in December. The purple flowers are fragrant and resemble those of *Heliotropium peruvianum*.

Odour.—The perfume of the heliotrope, as we have said, is "almondy," and it is probably on this account that the plant received the name cherry-pie. The natural perfume is only occasionally met with in the form of absolute, but the triple extract is sometimes used. This is obtained by macerating the flowers in warm fats, as soon after collection as possible.

Synthetic Otto.—The odour of heliotrope is approximated to very closely by piperonal-vanillone, with ordinary heliotropin as a good second. The objection to the latter body is its tendency to turn pink, and especially in creams and white cosmetic preparations. The former compound is not so prone to this decomposition, and when it is not available, may be replaced by vanillin, with traces of benzaldehyde. The "almondy" effect is also reproducible by means of methyl paratolyl ketone or acetophenone, but traces only are required. Floral notes may be obtained by the employment of rose, jasmin, and tuberose, while the tenacity of the perfume can be increased by the addition of hydroxy-citronellal, Peru balsam, or benzoin. Two formulæ follow :—

Heliotrope.

A.

Piperonal-vanillone	500 grams
Coumarin	100 „
Benzaldehyde	4 c.c.
Rose otto virgin	25 „
Jasmin synthetic	30 „
Tuberose concrete	40 grams
Geraniol from Palmarosa oil	200 c.c.
Hydroxy-citronellal	50 „
Balsam Peru	50 „
Aldehyde C_{14}	1 „

Keep in solution by the addition of q.s. benzyl benzoate and store in the dark.

Cherry-Pie.

B.

Heliotropin	400 grams
Vanillin	50 „
Methyl paratolyl ketone	10 c.c.
Hydroxy-citronellal	50 „
Phenylethyl alcohol	100 „
Musk ketone	40 grams
Cananga oil, terpeneless	50 c.c.
Rhodinol	100 „
Tuberose absolute	100 „
Benzoin R.	100 „

Keep in solution as above.

Alcoholic Perfumes are made as follows :—

C.

Piperonal-vanillone	20 grams
Coumarin	2 „
Rose extract triple	200 c.c.
Tuberose extract triple	100 „
Jasmin extract triple	200 „
Orange blossom extract triple	100 „
Amber liquid	10 „
Alcohol 90 per cent—to produce	1000 „

D.

Heliotrope synthetic "A"	30 c.c.
Jasmin extract triple	100 „
Neroli oil petale	2 „
Ylang-ylang oil—Manilla	1 „
Musk soluble 10 per cent	5 „
Civet „ 10 „	2 „
Alcohol—to produce	1000 „

HONEYSUCKLE.

History.—Among the many unexplained superstitions of by-gone days is the one in connection with the woodbine, for it is stated by ancient writers that the herb-diggers thought they would suffer bodily harm if they did not dig up the roots of this plant before sunrise.

The honeysuckle, *Lonicera*, is a twining shrub of the N.O. Caprifoliaceæ, native of the temperate regions of the northern hemisphere and often found growing wild in the hedgerows of England. It is a favourite for planting against our countryside houses and frequently forms a graceful covering for arbours, porches, etc.

Varieties.—The genus consists of about 80 species, of which the following may be noted (after D. McDonald) :—[1]

L. periclymenum, large creamy flowers, blooming early in the year—perfume most noticeable towards evening.

L. serotinum, reddish flowers late in summer and autumn.

L. caprifolium, goats are said to have a predilection for its leaves.

L. fragrantissima, bears white fragrant flowers about February.

L. brachypoda, yellow flowers, blooming from May to October. Known as Chinese honeysuckle.

L. sempervirens is a cultivated ornamental climber called trumpet honeysuckle.

There are two other "honeysuckles" which should not be confused with the above, namely :—

Hedysarum coronarium, known as the French honeysuckle and largely grown on the continent for feeding stock. It belongs to the N.O. Leguminosæ.

Banksia australis is an Australian species of the N.O. Proteaceæ, and named honeysuckle on account of the unusual amount of sweet liquid, like honey, contained in the flowers, which are sucked by the natives. It is stated to be

[1] "Fragrant Flowers and Leaves" (1895), 71.

so abundant in *B. ericifolia* and *B. Cunninghamii* that when in flower the ground underneath large cultivated plants is in a complete state of puddle.

Odour.—The perfume of the woodbine is delightfully sweet, and one writer goes so far as to say that the fragrance of the violet does not compare favourably with it. Poets have always shown a preference for it, and in the lines of Mott we read :—

> "By rustic seat or garden bower
> There's not a leaf or shrub or flower
> Blossoms on bush so sweet as thee,
> Lowly, but fragrant honey tree."

The natural perfume is not often met with in the form of absolute.

Synthetic Otto.—The base of artificial honeysuckle perfumes is composed of linalol, geraniol, or rhodinol, with moderate additions of hydroxy-citronellal. The floral note is obtained with jasmin, narcissus, or tuberose, and the usual fixing agents are vanillin combined with either styrax or mastic. Modification can be made by substituting methyl anthranilate and benzyl acetate for jasmin or para-cresol phenylacetate for narcissus, and a fixator of no mean order for this perfume is to be found in myrrh. Two formulæ are appended :—

Honeysuckle.

A.

Linalol	400 c.c.
Geraniol	200 „
Hydroxy-citronellal	50 „
Rose oil virgin	50 „
Neroli oil	50 „
Ionone alpha	10 „
Jasmin absolute	40 „
Tuberose absolute	40 „
Para-cresol phenylacetate	10 „
Vanillin	50 grams
Styrax R.	50 c.c.
Terpineol	50 „

Woodbine.

B.

Bois de rose oil	500 c.c.
Rhodinol	50 „
Phenylethyl alcohol	50 „
Petitgrain oil, terpeneless	40 „
Narcissus synthetic	60 „
Mimosa absolute	20 „
Vanillin	20 grams
Benzyl acetate	30 c.c.
Methyl anthranilate	30 „ (melted)
Myrrh R.	25 „
Olibanum R.	25 „
Tolu R.	25 „
Musk ketone	24 grams
Benzaldehyde	1 c.c.
Mastic R.	100 „

Alcoholic Perfumes are not often required, but the following will demonstrate the lines on which to proceed :—

C.

Chèvrefeuille synthetic	20 c.c.
Violet extract triple	100 „
Rose „ „	100 „
Jonquille „ „	200 „
Musk soluble 10 per cent	5 „
Alcohol—to produce	1000 „

HYACINTH.

History.—The hyacinth, *Hyacinthus orientalis*, belongs to the N.O. Liliaceæ, and is a native of Syria and other parts of Western Asia. It is believed to be the plant so frequently referred to in ancient classical literature. Homer describes it as a fragrant, bell-shaped flower, and says it took the foremost place on the mass of fragrant blossoms that formed the couch of Jupiter and Juno. Pliny refers to it as having a grassy leaf with the smell of the grape flower, while other writers called it the scented cornflag. The Greek virgins all wore crowns of hyacinths when assisting at the weddings of their friends, and "Ovid" (Book X.) attributes its origin to Hyacinthus, a beautiful

Spartan youth, son of Amyclas, King of Amyclæ, who was beloved by Apollo, and accidentally killed by the god in a game of quoits. From his blood a flower sprang up whose petals bore the marks of Apollo's grief.

The hyacinth was introduced to Britain during the sixteenth century, and was at that time a single-flowered species, but during the seventeenth century double-flowered ones began to appear. It is extensively cultivated in Holland, particularly at Haarlem, where there are large areas devoted entirely to the growth of this and other bulbous plants. The explanation of this extraordinary development in horticulture appears to be due to the peculiar adaptability of the soil and climate of Holland. When these huge areas are covered with blooms they present a wonderful sight, and the atmosphere for miles around becomes impregnated with their exotic fragrance.

Varieties.—The genus *Hyacinthus* comprises about thirty species, the varieties of which through cultivation have become numerous. *H. orientalis* is the principal cultivated species, while *H. non-scriptus*, the blue-bell, and *Muscari racemosum*, the grape-hyacinth, are often found growing wild in this country.

Odour.—The odour of hyacinths is heavy but has been described as ethereal. The natural perfume is extracted by means of volatile solvents, and an essential oil has been isolated by a process similar to that for the preparation of *absolutes*. It had a disagreeable and pungent odour, and only resembled the true odour of the flower after great dilution. The following bodies have been identified as constituents:—[1]

Benzyl benzoate.
Benzyl alcohol.
Esters of cinnamic alcohol.
Hydrogen sulphide.
A body with a distinct odour of vanillin.

[1] Spalteholz and Enklaar, "Chem. Weekblad," 7 (1910), 1, through "Year Book of Pharmacy" (1910), 82.

Synthetic Otto.—The reproduction of the hyacinth odour is one of the easiest in synthetic perfumery, as there are several definite chemical bodies whose odour, particularly on dilution, has a marked resemblance to that of the flower. The most important of these is phenylacetic aldehyde, a liquid of syrupy consistency which has a tendency to polymerise and become exceedingly viscous, occasionally throwing down an unsightly deposit. It is known as *Hyacinthin*, and 4 to 5 grams dissolved in a litre of alcohol will produce the equivalent of a first pomade washing. Its odour is approximated to by *a*-bromstyrol, but this material has a rather harsh odour and is very little used in fine perfumery. It finds employment, however, in the soap industry. Other bodies having an odour recalling hyacinths are, cinnamic alcohol, styrolene acetate, and (to a less extent) phenyl propyl alcohol. The proportion of the first-mentioned body in synthetic hyacinth oils rarely exceeds 40 per cent, and this can be much reduced when cinnamic alcohol is used in addition. The modifiers include such bodies as terpineol, benzyl alcohol, benzyl acetate, heliotropin amorphous, coumarin, vanillin, and phenylethyl alcohol.

When *a*-bromstyrol is used, traces of methyl paratolyl ketone or benzaldehyde should be added to tone down the rough edges. The best fixatives comprise benzoin, styrax, and cistus. Two formulæ follow :—

Hyacinth.

A.

Phenylacetic aldehyde	400 c.c.
Cinnamic alcohol	100 „
Benzyl alcohol	100 „
Benzyl acetate	50 „
Phenylethyl alcohol	50 „
Piperonal-vanillone	50 grams
Musk extract soluble 10 per cent	10 c.c.
Rose absolute	20 „
Jasmin concrete	20 grams
Benzoin R.	200 c.c.

Jacinthe.

B.

Hyacinthin	300 c.c.
Styrone	150 „
Terpineol	200 „
Petitgrain oil, terpeneless	50 „
Tuberose absolute	50 „
Rose synthetic	50 „
Benzyl acetate	50 „
Heliotropin	20 grams
Coumarin	20 „
Vanillin	10 „
Styrax R.	100 c.c.

Alcoholic Perfumes are generally compounded from phenylacetic aldehyde and terpineol together with triple extracts of similar odour. They can also be made by utilising either of the foregoing oils. Examples follow :—

C.

Hyacinth synthetic "A."	15 c.c.
Amber liquid	5 „
Tuberose triple extract	500 „
Alcohol—to produce	1000 „

D.

Phenylacetic aldehyde	5 c.c.
Terpineol	5 „
Orange blossom triple extract	400 „
Tuberose triple extract	400 „
Jasmin „ „	80 „
Rose „ „	100 „
Musk soluble 10 per cent	5 „
Benzoin R.	5 „

JASMIN.

History does not appear to contain any definite references to the jasmin flower until about the sixteenth century. It belongs to the N.O. Oleaceæ, and is supposed to be a native of India and to have become indigenous to southern Europe at an early date. Dioscorides tells us that the Persians obtained an oil from a white flower with

which they perfumed their apartments during the repasts, and it is possible that this may have been the jasmin. The Hindus have always used perfumed flowers in the performance of their religious rites, and they also are stated to have had a particular preference for this flower. The origin of the introduction of jasmin into Italy has given rise to a legend recorded by Donald McDonald,[1] which relates that a certain Duke of Tuscany was the first possessor of the plant, and as he wished to retain it as a novelty, forbade his gardener to give away a single sprig of it. The latter gentleman, however, seems to have neglected his instructions, and being an ardent lover, presented his lady with a bunch of the prohibited blossoms on her birthday. She was so charmed with the perfume of the flowers that she planted them in the ground, and by careful cultivation was able to produce large quantities of the blossoms, which she sold, and, after amassing a fortune, married the happy gardener. To-day jasmin is so common that it is difficult to find many gardens in Europe that are not graced by its presence.

Varieties.—The species most commonly known in Britain is *Jasminum officinale*, and its varieties have golden and silver-edged leaves, while some are double-flowered. The blossoms appear from June to October, and while their perfume is sweet, its power does not approach that of the same species grown in warmer climates.

J. sambac is a native of Arabia, but is found growing wild in India. It is a climber, with single and double white flowers which emit a most delightful fragrance. *J. trifoliatum* is a variety of this species known in India as *Kuddamulla* and in this country as the "Tuscan" jasmin. It seems possible that this may be the variety referred to in the legend related above.

J. odoratissimum is a native of Madeira, with yellow flowers, which retain their perfume when dry.

[1] "Fragrant Flowers and Leaves" (1895), 59.

J. azonicum has white flowers, and is also a native of Madeira.

J. paniculatum is a native of China, and has white flowers, which are used for scenting tea.

J. hirsutum has white flowers of exceptional fragrance, and is also a native of China and possibly India.

J. nudiflorum and *J. revolutum* are Chinese varieties with yellow perfumed flowers.

J. gracillimum has white flowers.

J. grandiflorum is a native of the East Indies, and occurs in both double and single form. It is known as the Spanish or Catalonian jasmin, and its flowers retain their perfume when dried. The plant resembles *J. officinale*.

Odour.—The odour of jasmin, like that of rose, is unique, and represents a type that cannot be *exactly* imitated at present by a mixture of any known synthetic aromatic chemicals or natural isolates.

Natural Perfume.—In the south of France the natural perfume is obtained from *Jasminum grandiflorum* and allied species. The blossoms are collected from July to October, but those gathered in August and September yield the largest quantity of perfume. The flowers are picked off the stem as soon as possible after they open, which usually occurs in the evening up to the middle of August, and in the early morning after that date. When plenty of labour was available before the Great War, these times were regularly adhered to, but of late much difficulty has been experienced owing to a shortage of personnel. Normally, collection is completed about 11 a.m. daily, when the heat of the sun becomes so intense as to endanger the fragrance of any unpicked blossoms. Recently it has become necessary for the few available workpeople to continue picking all day with frequent rests. This has resulted in a heavy increase in cost of production and also a diminution in fineness of perfume. In addition to these difficulties the cultivators of jasmin at Caillan, in the department of Var, have experienced considerable losses through the

[*Roure-Bertrand Fils.*

FIG. 39.—The Collection of Jasmin.

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attacks of caterpillars, which have not only eaten the leaves but have attacked the corollas about midway, with the result that the flower has rapidly withered. The flowers after collection are immediately conveyed to the works, where their aromatic constituents are extracted by enfleurage or by means of volatile solvents. The comparative value of these two processes in relation to this flower has led to much discussion and has already been referred to in the chapter on the production of flower perfumes. There is also some difference of opinion as to the constitution of the jasmin perfume, but it is generally recognised that the analysis made by Hesse and Muller[1] in 1899 represents its probable composition. A liquid otto of jasmin was obtained from pomade by steam distillation, and this was found to contain :—

Benzyl acetate	65	per cent
Linalol	16	„ „
Linalyl acetate	7	„ „
Benzyl alcohol	6	„ „
Other bodies	5·5	„ „

The composition of the unidentified constituents was investigated later by Hesse, and among those bodies found were the following :—

Indol	3	per cent
Jasmone	3	„ „
Methyl anthranilate	0·5	„ „

Other bodies identified include *p*-cresol and geraniol.

All the above-mentioned bodies, with the exception of the ketone jasmone, are prepared synthetically, but it is interesting to note that a synthetic *jasmone* has been patented by Heine & Co. (119,890) and a synthetic *jasmal* by Verley, who prepares it from phenylglycol, formaldehyde, sulphuric acid, and water. The characteristic odour of the jasmin is attributed to this illusive ketone, and the exact reproduction of the perfume is impossible without it.

[1] "Berichte" through "Year Book of Pharmacy" (1901), 74.

Synthetic Otto.—The basic constituent of all synthetic jasmin oils is benzyl acetate, whose odour bears a distinct resemblance to that of the flower. It is used up to about 40 per cent, but this quantity can be reduced if benzyl formate is also employed. The latter body has a much harsher note, and its use is not recommended. If desired, the aroma of either ester can be much improved and *softened* by the addition of small quantities of meta-cresol phenylacetate—the mixture being allowed to mature a month before use. Benzyl alcohol, benzyl propionate, and phenylethyl alcohol are useful, while linalol and its acetic acid ester are indispensable constituents. Methyl anthranilate enters the composition of most synthetic jasmins, but much better results are obtained with terpeneless French petitgrain oil. Indol is a necessary constituent, but 1 per cent should not be exceeded. The objection to the use of this body is that it produces a deep red colour on standing, and especially on exposure to light, which precludes the employment of oils containing it in such cosmetics as white skin creams, etc. On this account *colourless* jasmins are now made, and the place of indol is often taken by phenylacetic acid and occasionally by tetrahydro paramethyl quinoline. All these bodies, however, will not reproduce the true jasmin odour, and as jasmone is not readily obtainable, we have to turn to natural jasmin to supply the characteristic note. The concretes or absolute liquids produce remarkably good results when used up to about 10 per cent for "de luxe" products. The price of the finished article will of course depend upon the percentage employed, and even 1 per cent makes a noticeable difference to the perfume without appreciably increasing the cost. The floral note may be improved by adding neroli oil and tuberose or orange blossom absolute. Indol, when used, will act as a fixative, but the odour is improved and its persistence increased by the inclusion of hydroxy-citronellal or cinnamic alcohol. Phenylethyl butyrate, methyl ionone, decylic aldehyde, octyl acetate, and cinnamyl acetate are occasionally used as ingredients of this perfume. The following formulæ will

give an idea of how these numerous bodies may be employed, and the quantities can be varied to suit individual requirements. It will be noticed that the constitution of the natural oil is approximately followed :—

Jasmin Extra.

A.

Benzyl acetate	450 c.c.
Bergamot oil, terpeneless	50 ,,
Bois de rose oil	50 ,,
Benzyl alcohol	75 ,,
Phenylethyl alcohol	75 ,,
Indol	0·5 gram
Hydroxy-citronellal	75 c.c.
Orange blossom absolute	75 ,,
Tuberose absolute	50 ,,
Jasmin absolute liquid	100 ,,

Jasmin.

B.

Benzyl acetate	350 c.c.
Benzyl formate	50 ,,
Meta-cresol phenylacetate	1 ,,
Linalol	100 ,,
Linalyl acetate	75 ,,
Benzyl alcohol	145 ,,
Methyl anthranilate	25 ,,
Tilleul extra conc.	100 ,,
Indol	1 gram
Neroli oil	75 c.c.
Aldehyde C_{10}	3 ,,
Jasmin concrete soluble	75 grams

Jasmin—Colourless.

C.

Benzyl acetate	400 c.c.
Benzyl propionate	125 ,,
Bergamot oil	50 ,,
Linaloe oil cayenne	50 ,,
Benzyl alcohol	100 ,,
Petitgrain oil—French	60 ,,
Hydroxy-citronellal	80 ,,
Octyl acetate	20 ,,
Cinnamic alcohol	75 ,,
Phenylacetic acid	15 grams
Musk ambrette	25 ,,

Alcoholic Perfumes are usually compounded from the triple extract, and this frequently accounts for 80 per cent of the total. Formulæ follow illustrating this type and also those containing synthetics :—

D.

Orange blossom triple extract	75	c.c.
Tuberose triple extract	150	„
Musk extract soluble 10 per cent	2	„
Civet „ „ 10 „	3	„
Wintergreen oil	0·1	„
Jasmin extract triple—to produce	1000	„

E. (Oriental Type).

Tuberose extract triple	148	c.c.
Orange flower extract triple	50	„
Cassie absolute	0·1	„
Ylang-ylang oil—Manilla	0·4	„
Rose otto—Bulgarian	1·5	„
Jonquille extract triple	300	„
Jasmin extract triple	500	„

F.

Jasmin extra "A"	20	c.c.
Civet extract soluble 10 per cent.	3	„
Musk „ „ 10 „	2	„
Octyl acetate	1	„
Alcohol 90 per cent—to produce	1000	„

LILAC.

The Plant.—There are three well-known species of lilac, *Syringa vulgaris*, the common lilac ; *S. Chinensis*, the Chinese lilac ; and *S. Persica*, the Persian lilac. They belong to the N.O. Oleaceæ, and are natives of the East. The common lilac is a bushy, erect shrub, native of Persia, and was introduced into this country about 350 years ago. It has become one of our most common ornamental shrubs, of which there are several varieties, whose inflorescences may be red, purple, blue, or white. Of the *white* varieties the most popular are, Marie Legrange, Alba grandiflora, Alba magna, and Alba virginalis, while of the coloured

varieties, souvenir de L. spath, stands supreme with its massive clusters of large blossoms. It is stated that the "white lilac" so frequently exhibited by our florists in the winter is really one of the coloured forms which under a system of expeditious forcing at high temperatures in the dark has not developed any colour.

The Chinese or Rouen lilac comes between *S. vulgaris* and *S. Persica*, and is also known as *S. dubia* and *S. rothomagensis*. The Persian lilac is distinct from the above two species as it is smaller and more erect. It was introduced into Western Europe nearly 300 years ago. The branches are slender and spreading, and the flowers are deliciously fragrant. They take the form of small clusters, which are of a pale lilac colour, or nearly white. A pretty variety with deeply cut leaves, *S. luciniata*, is much esteemed.

The Perfume of lilac in the form of the natural absolute is not an article of commerce, and its constituents are not known. The basis of all synthetic ottos is terpineol, which on dilution closely resembles the odour of the natural flower. It may be used up to 60 per cent of the total, and is much improved by the addition of about 25 per cent of hydroxy-citronellal. Another base having a marked lilac odour is to be found in dimethyl benzyl carbinol. Good results are obtained by using about 20 per cent. These bases are blended with phenylethyl alcohol, or benzyl alcohol, and more character is given to the perfume by the use of heliotropin, vanillin, phenyl-cresyl oxide, and ylang-ylang oil, in small quantities. A fresh flowery note may be struck by the inclusion of some natural jasmin, and the compound may be fixed by a suitable addition of benzoin, musk ketone, ambergris, or floranal. Very good pseudo-lilacs can be compounded from synthetic muguet, in which case the employment of a little ionone will give satisfactory results. Formulæ for these compositions follow :—

Lilac.

A.

Terpineol	550 c.c.
Hydroxy-citronellal	150 „
Phenylethyl alcohol	50 „
Jasmin absolute	50 „
Heliotropin	20 grams
Vanillin	10 „
Musk ketone	10 „
Phenyl cresyl oxide	10 „
Bois de rose oil	40 c.c.
Benzoin R.	100 „
Octyl acetate	10 „

Persian Lilac.

B.

Otto muguet synthetic	600 c.c.
Ionone alpha	40 „
Phenylethyl alcohol	100 „
Ylang-ylang oil—Manilla	40 „
Tuberose absolute	50 „
Rose de mai absolute	25 „
Piperonal-vanillone	50 grams
Musk extract soluble 10 per cent	10 c.c.
Jasmin concrete	25 grams
Floranal	10 „
Balsam Peru	50 c.c.

Alcoholic Perfumes are made from synthetics, and the flowery effect is obtained by the liberal use of triple extract of jasmin :—

C.

Lilac synthetic "A"	30 c.c.
Cananga oil, terpeneless	2 „
Musk extract soluble 10 per cent	3 „
Tuberose triple extract	200 „
Jasmin extract triple	500 „
Alcohol 90 per cent—to produce	1000 „

D.

Lilac synthetic "B"	20 c.c.
Neroli oil	1 „
Jonquille extract triple	80 „
Tuberose „ „	100 „
Cassie „ „	30 „
Jasmin „ „	220 „
Musk „ soluble 10 per cent	2 „
Alcohol 90 per cent—to produce	1000 „

LILY.

History.—The lily has been noted for its delicate beauty since the time of King Solomon, and ancient writers have made many references to it. Theophrastus (400 B.C.) says : "Krina show many variations in colour. . . . The plant has in general a single stem, but occasionally divides into two, which may be due to differences in position and climate. On each stem grows sometimes one flower, but sometimes more ; for it is the top of the stem which produces the flower, but this sort is less common. There is an ample root, which is fleshy and round. If the fruit is taken off, it germinates and produces a fresh plant, but of smaller size ; the plant also produces a sort of tear-like exudation which men sometimes plant." Pliny also describes a method of artificially producing crimson lilies from the bulbils of a white lily. During this period the Greeks and Romans used the flowers at many of their feasts, and the former placed crowns of them upon the heads of their brides, as emblems of purity and abundance. There appears to be no record of the introduction of this bulbous plant into Britain, but it is assumed that the early Crusaders brought it from Palestine.

Varieties.—The name *lily* is often given to pretty flowering plants in general, but in botany is restricted to the genus *Lilium*, of which there are many species, natives of the temperate zone of the Northern Hemisphere. They are showy flowering plants, favourites in gardens, and are represented by—

L. auratum is one of the most beautiful, some forms having flowers nearly 12 inches in diameter. The petals are broad and white with reddish-brown spots, and the centre is golden-yellow in colour. This species is a native of Japan, and bulbs are imported annually.

L. bulbiferum is a handsome specimen about 2 feet high, bearing large crimson flowers shaded to orange.

L. candidum is well known as the white or madonna lily, and is universally cultivated. It is one of the finest

examples of this genus, and its perfume when flowering in the summer is fragrant, strong, and honey-like.

L. croceum, also known as the crocus or orange lily, is a hardy plant bearing in early summer huge heads of rich, large orange flowers.

L. gigantium is a noble species native of Nepal. The stems are erect and from 6 to 10 feet high. They terminate with a huge raceme, measuring 1 to 2 feet, and having many long nodding fragrant flowers which are white, tinged with purple in the inside.

L. longiflorum is one of the most valuable garden varieties, and is known as the white trumpet lily, on account of its large trumpet-like blooms of snow-white purity and delightful fragrance.

L. tigrinum, the tiger lily, is probably the commonest kind in our gardens, and some varieties commence to flower at the end of August, while others are as late as October.

The two examples following are included here for the sake of completeness, as the synthesis of their perfume resembles that of the above very closely.

Lily of the Valley is probably the favourite member of the N.O. Liliaceæ, on account of its exquisite fragrance. It is the single species of the genus *Convallaria*, known botanically as *C. majalis*, and on the Continent as *muguet*, or *lys*. It is a native of Europe, found generally in shady places in woods, and frequently grown in gardens for its pure, waxy, odorous flowers which blossom from April to June. There is a variety with golden-striped foliage, and another with double flowers, but these are not so pretty. The finest form is called *Fontin's*, which is more robust than the common kind and develops larger flowers. This species is not the lily of the valley spoken of by King Solomon.

Belladonna Lily is one of the most important members of the N.O. Amaryllidaceæ, and like the Guernsey lily, *A. sarniensis*, is a native of South Africa naturalised in the Channel Islands, from whence the bulbs are yearly imported to this country. The plant blooms late in the summer,

and its flowers, which are of a delicate silvery rose colour, exhale a most delicious fragrance recalling apricots. Other varieties, such as *A. treatea* and *A. cinnamonea*, are said to be natives of Brazil, and are largely cultivated in this country.

Odour.—Different lilies, as we have mentioned, exhale slightly different odours, which in general may be described as delicate, elusive, and "as sweet as honey." The odour of ylang-ylang in *extreme dilution* is fairly representative of the type.

Natural Perfume.—This is extracted by means of volatile solvents, and may be obtained as concrete or liquid absolute. The best synthetic perfumes always contain a small quantity of one of these products.

Synthetic Otto.—Hydroxy-citronellal is the finest base known for lily ottos, but before its discovery the majority of perfumes were compounded from terpineol and linalol. These are still used in combination with the first-mentioned material, and much improve its odour. The proportions used vary with the type of perfume being imitated, and while terpineol and linalol predominate in white lily, they are employed in smaller quantities for muguet, and amaryllis, where the characteristic note is struck by hydroxy-citronellal. The modifiers and blenders are not numerous, but include ylang-ylang, rhodinol, ethyl phenacetate, geraniol, and *traces* of para-methyl tolyl ketone or benzaldehyde. The flowery odour is obtained with natural muguet, and/or jasmin and rose, while the most efficient fixative is civet. Other useful fixators are ambrette oil, linaloe oil (cayenne), and floranal. Formulæ illustrating the use of the above bodies are appended :—

Madonna Lily.

A.

Terpineol	400 c.c.
Linalol from bois de rose oil . .	200 „
Hydroxy-citronellal . . .	100 „

A. *continued.*

Ionone alpha	10 c.c.
Musk ambrette	20 grams
Floranal	20 „
Oleo-resin orris	25 c.c.
Geraniol from palmarosa oil	50 „
Neroli oil	25 „
Ylang-ylang oil	50 „
Jasmin concrete	50 grams
Benzoin R.	50 c.c.

Muguet.

B.

Tilleul—extra conc.	500 c.c.
Ylang-ylang oil—Manilla	50 „
Licareol	100 „
Terpineol	80 „
Rose synthetic	50 „
Methyl paratolyl ketone	2 „
Jasmin concrete	50 grams
Ambrette oil	8 c.c. (melted)
Muguet absolute	100 „
Civet extract soluble 10 per cent	50 „
Phenyl glycol acetate	10 „

Amaryllis.

C.

Hydroxy-citronellal	450 c.c.
Ylang-ylang oil—Manilla	75 „
Santalwood oil	50 „
Neroli oil	50 „
Rose oil—Provence	100 „
Ethyl phenacetate	25 „
Jasmin absolute	20 „
Musk ketone	10 grams
Vanillin	19 „
Bois de rose oil	200 c.c.
Aldehyde C_{14}	1 „

Alcoholic Perfumes can be made by diluting any of the foregoing ottos, and it is usual to tint the perfumes so obtained with chlorophyll. When very flowery notes are desired triple extract of jasmin may be added. Formulæ follow :—

D.

Muguet synthetic	30 c.c.
Rose extract triple	200 ,,
Cassie ,, ,,	40 ,,
Orange blossom extract triple	30 ,,
Jasmin extract triple	300 ,,
Alcohol 90 per cent	400 ,,

E.

Hydroxy-citronellal	15 c.c.
Linalol	3 ,,
Ylang-ylang oil	2 ,,
Terpineol	2 ,,
Civet extract soluble 10 per cent	2 ,,
Musk ,, ,, 10 ,,	1 ,,
Vanillin	1 gram
Violet triple extract	54 c.c.
Rose ,, ,,	220 ,,
Jasmin ,, ,,	400 ,,
Tincture of orris	300 ,,

MAGNOLIA.

The genus *Magnolia* is named in honour of a professor of medicine, Pierre Magnol, who died in 1715. It consists of about sixty species of conspicuous trees and shrubs, natives of China, Japan, and America.

Varieties.—The most important species is the great laurel-magnolia, *M. grandiflora*, a native of the southern United States. It sometimes attains a height of 80 or 100 feet and is evergreen, with firm laurel-like leaves. The flowers are yellowish-white in colour, and stand upright, in the form of a cup 6 to 8 inches in diameter. They are highly odoriferous, and in England are the largest flowers of any trees growing in the open air. Their perfume is said to be inferior to that of the native-grown blossom. There are several varieties of this species.

Magnolia glauca is native of the eastern United States, where it is known as swamp sassafras, sweet laurel, and beaver tree. It is a pretty, sub-evergreen shrub, about 20 feet high, with leathery leaves, which are bluish-green

above and silvery below. The flowers are globular in shape, delightfully fragrant, and at first have a rich cream colour which gradually changes to a pale apricot tint. Other important species are *M. macrophylla*, with open, bell-shaped flowers, white, with a purple blotch at the base of the inner petals; *M. acuminata*, the cucumber tree, with lemon-yellow flowers; *M. tripetala*, the umbrella tree; *M. auriculata*, and *M. cordata*.

Odour.—The perfume of the majority of species of the genus *Magnolia* is exotic, and the fragrance resembles that of lily-rose, with just a suggestion of ylang-ylang.

Natural Perfume.—Oils have been obtained from Japan, but the species of magnolia from which they were extracted does not appear to be very clear. A list is appended of those bodies identified,[1] but unfortunately they cannot be taken as a guide to the compounding of the synthetic perfume :—

Cineol.
Citral.
Anethol.
Eugenol.
Methyl chavicol.
Phellandrene.
Linalol.
Terpineol.
Caprinic acid.
Oleic acid.
And possibly pinene.

Synthetic Otto. — This perfume is generally compounded from other floral oils, those of neroli and rose being of first importance. Modifications are obtained by the use of jasmin and tuberose, while the presence of citral, either as terpeneless lemon oil or as French verbena, is desirable. Traces of benzaldehyde, benzylidene acetone, and methyl salicylate are occasionally introduced for special effects. The finest fixative is undoubtedly balsam of Peru,

[1] Gildemeister and Hoffmann, "Volatile Oils," II., 374.

while amber and benzyl iso-eugenol are useful additions. Oakmoss resin also finds occasional employment in this direction. A formula is appended :—

Magnolia.

A.

Rose otto—Bulgarian	150 c.c.
Orange blossom absolute	300 „
Jasmin concrete	150 grams
Tuberose absolute	50 c.c.
Hydroxy-citronellal	150 „
Verbena oil—French	20 „
Lemon oil terpeneless	4 „
Methyl salicylate	5 „
Aldehyde C_{14}	1 „
Oakmoss R.	10 „
Amber liquid	60 „
Balsam Peru	100 „

Alcoholic Perfumes may be made either from the above or by using corresponding proportions of the natural *Quadruple* extracts :—

B.

Magnolia synthetic "A"	35 c.c.
Ylang-ylang oil – Manilla	5 „
Musk extract soluble 10 per cent	2 „
Civet „ „ 10 „	2 „
Alcohol 90 per cent to produce	1000 „

MIMOSA.

This plant belongs to the N.O. Leguminosæ, and there are several varieties of which over thirty have been identified on the Cote d'Azur. From the perfumer's point of view the most important of these are *Acacia floribunda* and *A. dealbata*, and both are cultivated for the extraction of their odoriferous constituents.

Odour.—The perfume of mimosa is faint but charming, and resembles cassie, especially in *A. floribunda*, while in *A. dealbata* it distinctly recalls the odour of ylang-ylang.

Natural Perfume.—This is extracted by means of volatile solvents, and the product of the former variety is a viscous, oily liquid, while that of the latter contains a higher percentage of wax and is concrete. Both absolutes are comparatively cheap and give excellent results in floral Cologne (*which see*), while in "de luxe" perfumes, particularly honeysuckle and heliotrope, they give floral notes which are unique: very fine bouquets of honey-like odour can be obtained by combination with muguet or jasmin.

Synthetic Otto.—The majority of commercial mimosa oils are mixtures of synthetics without any natural floral extracts, and although good results are obtained by this method, the use of 10 per cent of mimosa absolute makes all the difference to the smoothness and fixity of the blended mixture. In extreme dilution there are two bodies whose odours closely resemble that of the natural flower. They are methyl acetophenone and methyl paratolyl ketone, and when used, great care is necessary as they are exceptionally powerful, and if employed in excess will soon cover any bodies which may have been added as modifiers. In consequence 20 per cent should not be exceeded. The harsh odour of both these bodies may be toned down very considerably by mixation with hydroxy-citronellal and terpineol. The floral note is obtained with rose, jasmin, and cassie, while fixation is completed by the addition of cinnamic alcohol, balsam of Peru, or artificial musks. Two formulæ follow:—

Mimosa.

A.

Para-methyl acetophenone	200 c.c.
Hydroxy-citronellal	150 ,,
Terpineol	150 ,,
Cassie absolute	50 ,,
Rose de mai	100 ,,
Jasmin concrete	50 grams
Methyl heptine carbonate	5 c.c.
Ylang-ylang oil—Bourbon	45 ,,
Balsam Peru	75 ,,
Styrone	75 ,,
Mimosa absolute—liquid	100 ,,

[*Roure-Bertrand Fils.*

FIG. 40.—Sorting Mimosa.

[*To face page* 240.

Mimosa.

B.

Methyl paratolyl ketone	150 c.c.
Muguet synthetic	150 „
Cuminic aldehyde	10 „
Benzyl acetate	40 „
Geraniol	200 „
Terpineol	150 „
Cananga oil, terpeneless	30 „
Musk ambrette	20 grams
Methyl anthranilate	50 c.c. (melted)
Guaiac wood oil	200 „ „

Alcoholic Perfumes are obtained from the above as follows :—

C.

Mimosa synthetic	10 c.c.
Orris oil concrete	0·5 „
Benzoin R.	2·5 „
Musk extract soluble 10 per cent	2 „
Rose extract triple	300 „
Jasmin „ „	200 „
Cassie „ „ —to produce	1000 „

NARCISSUS.

History.—There are botanical references to this beautiful genus in the works of Theophrastus, but it is to Ovid that we owe the story of its creation. In his "Metamorphoses," Book III., he tells us that Cephisus, the river god, bore a beautiful child named Narcissus, and when Tiresias, the seer, was asked if he would live to a ripe old age he replied, "If he ne'er know himself." Mirrors were kept from him, and the saying of the prophet seemed but empty words, for Narcissus had reached the age of sixteen, and many maidens sought his love. But he was proud and cold, and so slighted the affections of Echo, the nymph, that she hid in the woods, became gaunt and faded until only her voice remained. Narcissus went to a pool one day to quench his thirst, and while there another thirst sprang up, for while he drank, he was smitten by the sight of the

beautiful form he saw reflected in the water and fell passionately in love with it. He attempted to clasp it in his arms, but after fruitless efforts killed himself in desperation. When he had been received into the infernal abodes, he kept on gazing at his image in the Stygian pool. His naiad sisters beat their breasts and shore their locks in sign of grief for their dear brother. When they prepared the funeral pile, the torches, and the bier, his body could not be found, but in its place was a flower, its yellow centre girt with white petals. That flower into which he had been changed still bears his name!

The narcissus is stated to have been brought to this country by the Romans.

Varieties.—Narcissus is the botanical as well as the familiar English name for a genus of bulbous plants of the N.O. Amaryllidaceæ, of which there are about 20 species. The following are worthy of note :—

N. bulbocodium is a species having slender, rush-like leaves, and is known as the hooped petticoat daffodil. In Spain it flourishes in wet meadows during the winter and spring, but disappears at other times. Here the colour is golden-yellow, while in southern France it is sulphur-yellow.

N. Jonquilla is known as the rush daffodil or jonquille, and is often found in our gardens, the bulbs being imported from Holland and Italy for forcing in pots. This fragrant plant is one of the most powerfully scented of all the genus, and a few blooms are sufficient for perfuming a large room.

N. Poeticus, poet's or pheasant's eye narcissus, is one of the oldest and most charming varieties, being widely distributed in Europe from the Pyrenees to Germany. It flowers from April to June. *Gardenia narcissus* is an elegant double variety grown largely for the London markets.

N. Pseudo-narcissus, the common daffodil, of which there are hundreds of varieties, both growing wild and under cultivation. They are divided into three principal kinds, golden, bicolors, and sulphur and white.

N. tazetta, the polyanthus or bunch-flowered narcissus,

[*Photo, Parfumerie Moderne, Lyon.*

FIG. 41.—Narcissus cultures at Carquieraine (Var.). Exceptional flowering season of the year 1921.

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is a native of southern Europe and western Asia, being abundant in Palestine, and during the flowering season it is to be found in nearly every house, especially in Damascus. By some it is considered to be the rose of Sharon, the original Hebrew word bulb being translated rose, and indeed a rosebud is something similar to the bulbs of this plant. It is the classic narcissus of Homer, Ovid, and other poets, both Greek and Roman. In China the flower is held to be sacred, and is known as the joss flower or sacred lily. The plant from each bulb bears tall, many-flowered, charming lily heads of from six to twenty-four large flowers. They are powerfully fragrant.

Odour.—Most of the species of this genus exhale perfumes which differs but slightly, and they have been described as resembling that of the violet with the sweetness of the lily. A suggestion of hyacinth is usually noticeable.

Natural Perfume.—Both N. tazetta and N. jonquille are cultivated for the extraction of their perfume in the south of France. Enfleurage and volatile solvent processes are employed, but the former is generally used for jonquille.

Synthetic Otto.—*Narcissus* floral oils are compounded with para-cresol *phenylacetate* as their base, but if this is not available para-cresol *acetate* may be used. The results obtained with the latter are not so satisfactory, as there is usually an odour suggestive of urine, even when employed in the pure state and in small quantities. Both materials are exceedingly powerful, and the odour of the phenylacetate is smoother. It is customary to blend either of these products with terpineol and phenylacetic aldehyde, and for this purpose linalol is also useful. Phenylethyl alcohol, ionone, and methyl anthranilate are often employed as modifiers, while good results may be obtained with benzyl acetate. Flowery notes are struck by the inclusion of natural absolutes of narcissus, tuberose, rose, and neroli, and fixation is completed with either benzoin, cistus, or artificial

musk. *Jonquille* oils resemble the above in practical perfumery, but the base differs in that *phenylethyl*-phenylacetate is used. Another slight odour modification is necessary, and this is obtained by the employment of traces of basil and patchouli, and of course jonquille absolute ; otherwise fixation may be accomplished on the same lines as for narcissus. Formulæ follow :—

Narcissus.

A.

Para-cresol phenylacetate	100 c.c.
Phenylacetic aldehyde	100 „
Linalol	200 „
Terpineol	200 „
Ionone beta	18 „
Methyl anthranilate	10 „
Phenylethyl alcohol	20 „
Narcissus absolute	100 „
Tuberose „	50 „
Rose de mai	50 „
Petitgrain oil, terpeneless French	50 „
Benzoin R.	100 „
Methyl para-cresol	2 „

Jonquille.

B.

Phenylethyl phenylacetate	200 c.c.
Phenylacetic aldehyde	50 „
Rose synthetic	100 „
Basil oil	5 „
Patchouli oil—English	5 „
Vanillin	40 grams
Cistus R.	10 c.c.
Jonquille absolute	100 „
Jasmin „	70 „
Orange blossom absolute	70 „
Bois de rose oil	300 „
Benzoin R.	45 „
Alcohol C_{10}	5 „

Alcoholic Perfumes may be prepared from the foregoing by dilution with alcohol or according to the following formulæ :—

Narcissus.

C.

Para-cresol phenylacetate . .	10 c.c.
Heliotropin	2 grams
Vanillin	2 „
Musk extract soluble 10 per cent .	1 c.c.
Benzoin R.	5 „
Jasmin extract triple . . .	200 „
Tuberose „ „ . . .	200 „
Narcissus „ „ —to produce .	1000 „

Jonquille.

D.

Phenylethyl phenylacetate . .	5 c.c.
Hyacinthin	1 „
Neroli oil petale extra . . .	2 „
Musk ambrette	2 grams
Jasmin extract triple . . .	150 c.c.
Tuberose „ „ . . .	150 „
Jonquille „ „ —to produce .	1000 „

NEW-MOWN HAY.

The Plants.—The peculiar fragrance of freshly cut hay is at once charming and unique. Many fodder grasses grow spontaneously in our pastures, but several are especially cultivated and include *Lolium perenne*, *L. italicum*, *Phleum pratense*, *Poa pratense*, *Cynosurus cristatus*, and *Anthoxanthum odoratum*. The latter, also known as sweet-scented vernal grass, contributes more towards the characteristic odour of the hayfields than the others, and peculiarly enough the odoriferous constituents are only developed in the stem when dried. Among other plants in which the hayfields perfume is noticeable are the following :—

Alyssum compactum.—Sweet alyssum bears small white flowers, and the plant is particularly fragrant after a shower of rain.

Asperula odorata, woodruff, is a wild perennial of the N.O. Rubiaceæ, growing in shady places near woods. The plant flowers in May, and the small white blossoms are profusely distributed over the tufts of whorled leaves. The

odour is emitted by the stem and leaves when dry, and in Germany these are put into wine to give it a distinctive flavour. There are other varieties with rose-blue flowers.

Liatris odoratissima is an evergreen plant thriving in the swamps of North America, where it is known as the vanilla plant, although it has no connection with the vanilla of commerce. According to Donald McDonald,[1] the leaves are disagreeable when fresh, but develop a delightful fragrance, resembling tonka bean when dry. They are used for flavouring cigars.

Melilotus officinalis, the common melilot, is a clover-like annual or biennial of the N.O. Leguminosæ, and when withered by the sun is almost as fragrant as the woodruff.

Melilotus alba, known as Bokhara clover, is used chiefly for bee-feeding on account of the honey found in the white blossoms. The seed and dried leaves are perfumed.

The Natural Perfume is due to the presence of coumarin, which is formed by the action of a ferment on a constituent of the plant. Bourquelot has shown that this constituent is probably *d*-glucose and the ferment probably emulsin. The experiments leading to this conclusion are described in the "American Perfumer" (1922), 57.

Synthetic Otto.—As coumarin is largely responsible for the odour of new-mown hay, we should expect to find it in foin coupé perfumes. It is used from 10 to 20 per cent, and the basic odour is completed by adding about double that amount of terpeneless lavender and bergamot oils. Dimethyl hydroquinone is a body having an odour of the coumarin type and is well suited to take its place, especially if a new and inimitable note is desired. The true reproduction of the odour is only possible by the employment of these bodies, although some perfumers use amyl salicylate and anisic aldehyde with coumarin, when the resulting odour resembles trèfle rather than foin coupé. When the former basic combination is used the most valuable modifiers are : methyl salicylate, ylang-ylang, oakmoss,

[1] "Fragrant Flowers and Leaves" (1895), 66.

and clary sage. They are employed in quantities varying between 1 and 10 per cent. The blend may be varied with diphenyl oxide, ionone, and benzyl acetate, while fixation is completed by the addition of floranal, hydroxy-citronellal, or any of the other bodies enumerated in the classified list of fixators. Formulæ follow :—

New-Mown Hay.

A.

Dimethyl hydroquinone	150 grams
Lavender oil, terpeneless	200 c.c.
Bergamot oil „	250 „
Methyl salicylate	50 „
Clary sage oil	30 „
Ylang-ylang oil—Bourbon	50 „
Oakmoss resin	20 „
Benzyl acetate	10 „
Phenyl cresyl-oxide	5 grams
Methyl heptine carbonate	5 c.c.
Floranal	30 grams
Hydroxy-citronellal	200 c.c.

Foin Coupé

B.

Coumarin	200 grams
Iso-butyl salicylate	100 c.c.
Iso-butyl phenacetate	50 „
Anisic aldehyde	50 „
Linalyl acetate	250 „
Cananga oil, terpeneless	50 „
Rose geranium oil	50 „
Terpinyl acetate	140 „
Jasmin synthetic	40 „
Violet „	40 „
Diphenyl methane	20 grams
Clary sage oil	10 c.c.

Alcoholic Perfumes may be made by simple dilution of the above ottos. Better results are, however, obtainable by compounding the perfume on the lines indicated below :—

C.

Lavender oil—English	10 c.c.
Neroli oil—bigarade	5 „
Verbena oil	1 „
Sweet orange oil	5 „
Lime oil	3 „
Wintergreen oil	1 „
Coumarin	20 grams
Cassie extract triple	150 c.c.
Rose „ „	200 „
Castor extract soluble 10 per cent	3 „
Civet „ „ 10 „	2 „
Alcohol—to produce	1000 „

ORANGE BLOSSOM.

History.—*Citrus aurantium* is a low, much branched tree of the N.O. Rutaceæ, found wild in Western and Upper India and early cultivated in Persia. Its fruit is supposed to be the golden apples which the daughter of Hesperus caused to be so strictly guarded by the dragon. The tree was believed to have been introduced to the countries of the Mediterranean and to Italy about the ninth century, and, like all other plants long cultivated by man, many varieties have sprung up, such as the blood or Malta orange, which has a red rind and flesh. The orange tree attains a great age, and in some parts of Spain is stated to be 600 years old, while one growing in a box at Versailles is said to have been planted in 1421. In Spain, Portugal, and Italy the plants are cultivated for their fruit, but in the south of France they are grown almost exclusively for their flowers. Here they are grown from pips, and the young plants are grafted when about three years old. When the seedling is about 4 ft. high it is transplanted and allowed a year to gain strength before being grafted. The cultivation of the plant requires much attention, and a crop of flowers is not expected before the fourth year after transplantation. In China, and particularly at Canton, the blossoms are collected when fully expanded and are used for scenting tea known as Orange Pekoe. As far back as the 16th century

FIG. 42.—Provence Orange Trees in full bloom. [*Antoine Chiris.*

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the Italian philosopher Porta obtained what he described as an oil of exquisite fragrance by distilling flowers of the citron tribe. About 1680 the oil from orange flowers was called essence of neroli from the fact that it was used for perfuming gloves by the wife of Flavio Orsini, prince of Neroli.

Varieties.—The sweet or Portugal orange is the *Citrus aurantium* of Risso, who enumerates nineteen varieties.

The bitter or Seville orange is the *Citrus Bigaradia*, Duhumel; *C. aurantium*, var. *amara* Linnæus; and *C. vulgaris* of Risso, who describes twelve varieties. These are, however, in every respect superior to the former kind.

Odour.—The flowers of both sweet and bitter varieties are exceedingly fragrant, although those of the latter have a finer aroma, which recalls jasmin very slightly. The trees of the orange grove all blossom about the same time, and the perfume is perceptible at a considerable distance.

Natural Perfume.—The bitter orange tree yields four distinct products which are of value to the perfumer. They are:—

Oil of neroli, from the blossoms by distillation.

Orange flower absolute, from the blossoms by extraction (warm fats or volatile solvents).

Oil of petitgrain, from the leaves and twigs by distillation.

Oil of orange, from the peel by expression.

In the south of France the orange flower crop is collected during May,[1] and the yield of oil depends upon atmospheric conditions and upon the time of collection. The best results are obtained from the middle of the month onwards, when if the weather be warm and dry 1000 kilograms of flowers will produce as much as 1500 grams of oil, although higher figures have been recorded. The average is nearer 1000 grams, and under adverse conditions may be as low

[1] A second crop is obtained in October if conditions are favourable.

as half that amount. Although as stated above the blossoms may be treated by different methods for the extraction of their odoriferous constituents, that of distillation is most common on account of the much higher yield obtained. This is clearly indicated from the following figures, which are the approximate average yield per 1000 kilogrammes of fresh orange blossom :—

1. Distillation	. .	from 900 to 1100 grams of oil
2. Volatile solvents	. .	„ 550 „ 600 „ „ „
3. Maceration	. . .	„ 350 „ 450 „ „ „
4. Enfleurage	. . . .	about 100 „ „ „

Distillation has always been the principal process, but at one time it was applied for the *Orange Flower Water* rather than for the oil, which was not much valued, and looked upon as a comparatively insignificant by-product. As we all know to-day, things are very different and the oil fetches high prices. The aqueous distillate is, however, a much esteemed article of commerce, and its odour, like that of the *absolute*, approximates more nearly to the fresh blossom than does the oil. Immediately after distillation this is a pale yellowish liquid, which gradually darkens with age until it becomes quite red, especially if exposed to strong light for a lengthy period. Under these conditions the odour of the oil is impaired, and if its delightful fragrance is to be retained, it should be stored in air-tight containers in a dark and cool atmosphere. The composition of neroli oil has been known since 1895, but the first complete analysis was not published until 1902, when the announcement was made by Hesse and Zeitchel in the "Journal fur Praktische Chemie."[1] So far, the following constituents have been identified :—

Terpenes, chiefly dipentene, pinene, and camphene	35 per cent
l-Linalol	30 „ „
Geraniol and nerol	4 „ „

[1] Through Gildemeister and Hoffmann, "Volatile Oils," III., 97.

[*Roure-Bertrand Fils.*

FIG. 43.—Collection of Orange Flowers.

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Phenylethyl alcohol (found in the oil from the aqueous distillate)	traces
d-Terpineol	2 per cent
d-Nerolidol	6 „ „
Decylic aldehyde	traces
l-Linalyl acetate	7 per cent
Neryl and geranyl acetates	4 „ „
Esters of phenylacetic acid and benzoic acid	traces
Indol	up to 0·1 per cent
Methyl anthranilate	0·6 per cent
Jasmone, farnesol, acetic and palmitic acids	traces

The characteristic odour of the oil is primarily due to methyl anthranilate (and possibly jasmone), although such a small quantity is present, but there appears to be very little doubt that it is also influenced by both indol and aldehyde C_{10}. The odour of some oils would suggest that geranyl formate might be a possible constituent, but so far there appears to be no analytical evidence in support of this.

Oil of petitgrain was according to Sawer[1] referred to as far back as 1692 by Pomet in his "Histoire des Drogues"; at that time it was distilled from the small unripe fruits about the size of a cherry which fall from the trees shortly after the flowers; they are called "orangettes," and the origin of the name is attributed to these small seeds. The orange trees are pruned about the end of June, and from these prunings are separated the leaves and twigs which on distillation yield the petitgrain oil of to-day. The finest oils are obtained from the bitter orange trees of France, although other oils are distilled in Tunis and Paraguay. The sweet orange, the lemon, and the mandarin also yield petitgrain oils of distinct type which are useful in perfumery, but in odour they do not approach neroli oil so nearly as the first-mentioned product.

Synthetic Otto.—Many of the finest neroli oil imitations are nothing more nor less than terpeneless petitgrain

[1] "Odorographia" (1892), 83.

oil to which has been added in some cases neroli and aldehyde C_{10} : such products may be compounded as follows :—

Neroli.

A.

Petitgrain oil—French, terpeneless	800 c.c.
Nerol	100 „
Aldehyde C_{10}	10 „
Neroli oil—Portugal	90 „

The basis of the cheaper synthetic nerolis consists of one or more of the following given in the order of their importance—nerol, methyl naphthyl ketone, linalol, geraniol, and phenylethyl alcohol. The addition of linalyl acetate improves the odour of these bases, but terpeneless bergamot gives results which are nearer to the aroma of the true neroli. The most useful modifiers are geranyl formate, benzyl acetate, and hydroxy-citronellal, all of which may be employed up to 5 per cent or more. Methyl anthranilate and indol are the two indispensable constituents of pseudo-neroli oil, and while the former may reach 10 per cent of the total, the latter should not exceed 1 per cent. Less can be employed if phenylacetic acid enters the formula. Decyl aldehyde is more useful than nonyl aldehyde, but 1 per cent should not be exceeded. Of the fixators included in the classified lists iso-butyl benzoate stands pre-eminent, followed closely by mastic, tolu, and benzoin. Nerolin should not be used unless the cheapest products are desired, as oils of harsh odour generally result. Formulæ illustrating the employment of these numerous bodies are appended :—

Neroli.

B.

Linalol ex bois de rose	200 c.c.
Bergamot oil, terpeneless	50 „
Nerol	150 „
Phenylethyl alcohol	100 „
Geranyl formate	25 „
Benzyl acetate	25 „

[*Roure-Bertrand Fils.*

FIG. 44.—Distillation of Orange Flowers.

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B. *continued.*

Hydroxy-citronellal	50 c.c.
Methyl anthranilate	50 „
Indol	5 grams
Phenylacetic acid	5 „
Aldehyde C_{10}	10 c.c.
Iso-butyl benzoate	80 „
Mastic R.	50 „
Petitgrain oil—French	200 „

C.

Nerol	400 c.c.
Linalol	100 „
Methyl anthranilate	100 „
Indol	5 grams
Methyl naphthyl ketone	100 „
Aldehyde C_9	5 c.c.
Geranyl formate	20 „
Muguet synthetic	60 „
Jasmin „	30 „
Rose „	30 „
Linalyl acetate	100 „
Benzoin R.	50 „

D. (Cheap).

Limonene	500 grams
Geraniol	150 „
Geranyl formate	20 „
Linalol	100 „
Methyl anthranilate	100 „
Indol	10 „
Beta naphthol ethyl ether	10 „
Bergamot oil	50 c.c.
Tolu balsam	60 „

ORCHIDS.

The Plant.—*Orchis* is the name of a Linnæan genus and the type of an extensive family of plants termed *Orchidaceæ*, generally referred to as orchids. The number of known species exceeds 6000, and they take the form of shrubs or herbaceous perennials, all of which are particularly handsome and deservedly popular. They are found in tropical and temperate countries ; a large number grow on trees, some grow on rocks, and many have tuberous roots growing in the ground, of which over forty are

natives of this country. Although the species are numerous, the only one of economic importance to the chemist-perfumer is *vanilla*. In Asia, a farinaceous meal is obtained from the tubers of several terrestrial orchids. This is known as *Salep*, and in Northern India it is largely used as food by the natives. In this very large group of plants, there is an unusually wide range of floral variations, those of form and colour being particularly noticeable. The flowers also exhale a variety of odours, ranging from the most exquisite fragrance to the most disagreeable putrescence. During recent years orchids have become highly patronised as peculiar and attractive garden plants, and to obtain them plant collectors have gone to the most remote regions of both hemispheres; they have thus become important trade plants. High prices have been obtained for rare varieties, and in 1881 an amateur collection realised over £5000, some individual plants being sold for as much as £100 or even more.

Odour Varieties.—According to Donald McDonald[1] a series of observations on the odours of orchids was conducted by E. Andre, an eminent French botanist, and among the varieties exhibiting peculiar scented attractions are the following :—

Acropera Loddigesii, the dainty scent of wallflowers.

Angræcum fatuosum, a sweet odour of tuberoses.

Bifrenaria inodora, like muguet.

Catasetum scurra, the aroma of lemons.

Cattleya Eldorado, an odour of roses in the evening only.

Cleistoma ionasmum, violet-scented.

Cæliopsis hyacinthesma, the perfume of hyacinths.

Dendrobium glumaceum, lilac in the evening, and heliotrope in the morning.

Dendrobium nobile, odour of hay in the evening, honey at noon, and primrose in the morning.

[1] "Fragrant Flowers and Leaves" (1895), 86.

Epidendrum vulnerum, an odour of carnations in the morning.

Maxillaria aromatica, cinnamon-scented.

Odontoglossum citrosum, rose-scented.

Odontoglossum gloriosum, like a whole hedge of hawthorn.

Orchis Sambucina, the odour of elder flowers.

Zygopetalum Mackayi, hyacinth-scented during sunshine.

Synthetic Otto.—Iso-butyl salicylate is the most useful base for all orchid perfumes, but when it is not available very good results are obtained by substituting amyl salicylate, although the note is not so floral. The odour of both these bases is suitably modified by additions of rhodinol, nerol, and linalol. The blend is perfected according to individual tastes, and providing the laws of harmony are adhered to any of the flower modifications enumerated above may be employed. Of the fixatives, oakmoss is the most useful, and it can be supplemented by additions of ylang-ylang, benzoin, or Peru, according to the type of odour being imitated. Phenylacetic acid is another valuable fixator, as are also the musks, vanillin, and coumarin. Formulæ follow :—

Orchid.

A.

Iso-butyl salicylate	400 c.c.
Linalol	100 ,,
Rhodinol	100 ,,
Phenylethyl alcohol	75 ,,
Nerol	75 ,,
Phenylacetic aldehyde	50 ,,
Hydroxy-citronellal	50 ,,
Oakmoss R.	10 ,,
Ylang-ylang oil—Manilla	40 ,,
Benzoin R.	100 ,,

Orchid.

B.

Amyl salicylate	500 c.c.
Anisic aldehyde	200 „
Geraniol	100 „
Acetophenone	50 „
Bois de rose oil	50 „
Dimethyl hydroquinone	10 grams
Benzaldehyde	2 c.c.
Heliotropin	35 grams
Balsam Peru	50 c.c.
Aldehyde C_9	3 „

Alcoholic Perfumes, like the ottos, are not much in demand, and different makes are subject to wide variation. An example of the violet type follows :—

Amyl salicylate	5 c.c.
Hawthorn synthetic	2 „
Vanillin	2 grams
Ylang-ylang oil—Manilla	1 c.c.
Oleo resin orris	5 „
Musk soluble 10 per cent	2 „
Civet „ 10 „	3 „
Jasmin extract triple	200 „
Violet „ „ —to produce	1000 „

RESEDA.

The Plant.—Mignonette, *Reseda odorata*, is the type of the N.O. Resedaceæ, consisting of over twenty species, and native of Egypt and the shores of the Mediterranean. The plant was known to Pliny, and in those days the Romans used it as a charm to allay the irritation of wounds. At an early date it was introduced to the south of France, where it received the name of mignonette, signifying in French "little darling." It made its appearance in Britain about 1750, and two years later is stated to have been cultivated in the Apothecaries' Botanic Gardens, Chelsea. Since then it has been a great favourite, and in this country is an annual, while in the south of Europe it becomes

shrubby. The flowers were originally greyish-white with red stamens, but have since given place to fine white, red, and yellow-flowered varieties.

Odour.—The perfume of the common mignonette grown in this country is poor compared to the very fine fragrance obtained by careful cultivation in the south of France. The odour recalls that of violet leaves and basil.

Natural Perfume.—In the south of France, reseda is largely grown for its perfume, which is extracted by both enfleurage and volatile solvents. The plant is delicate and the crops often fail in consequence of late winds. The flowers gathered in March and April produce the finest perfume. The yield of essential oil is as low as about 0·002 per cent, and its chemical constitution has not been determined.

Synthetic Otto.—There are few synthetic aromatic chemicals with odours resembling reseda, and the majority of imitations really contain fairly large proportions of the natural absolute. Ethyl decine carbonate probably bears the closest resemblance, and is used up to about 5 per cent of the total. This material can be backed up by tolylethyl alcohol and methyl ionone, when a fairly good base results. Another body having a distinct reseda-like odour is hexyl-methyl ketone, and providing it is blended with one of the violet ketones, will make a useful base. The floral note is obtained by the employment of natural jasmin and cassie in addition to reseda absolute, while the odour may be modified by including traces of aldehyde C_{12}, and basil oil. The use of the latter gives results which approximate very closely to the odour of the flower, and as much as 5 per cent may be employed. The synthetic ottos are best fixed with oleo-resin orris and labdanum, but variations may be made with musk ambrette, kostus, or styrax. Formulæ follow :—

Reseda.

A.

Ethyl decine carbonate	50 c.c.
Methyl ionone	200 „
Tolylethyl alcohol	200 „
Cassie absolute	100 „
Jasmin „	100 „
Orris oleo-resin	75 „
Labdanum R.	50 „
Reseda absolute	200 „
Duodecyl alcohol	20 „
Clary sage oil	5 „

Reseda.

B.

Methyl ionone	300 c.c.
Hexyl methyl ketone	100 „
Violet leaves—concrete	50 grams
Methyl heptine carbonate	10 c.c.
Aldehyde C_{12}	10 „
Benzyl acetate	50 „
Orris resin	50 „
Basil oil	50 „
Santalwood oil	100 „
Cistus R.	40 „
Geraniol	100 „
Ylang-ylang oil—Bourbon	30 „
Musk ambrette	10 grams
Reseda—concrete	100 „

Alcoholic Perfumes consist very largely of reseda triple extract, but may be made from the synthetic ottos given above. It is usual to include some cassie and tuberose, while both rose and violet are not uncommon constituents. Formulæ are appended :—

C.

Reseda synthetic "A"	10 c.c.
Musk extract soluble 10 per cent.	2 „
Civet „ „ 10 „	3 „
Tuberose extract triple	65 „
Reseda „ „	200 „
Alcohol 90 per cent	720 „

D.

Rose absolute	0·5 c.c.
Tuberose absolute	0·5 „
Cassie triple extract	100 „
Hexyl methyl ketone	1 „
Santalwood oil	1 „
Violet synthetic	2 „
Musk extract soluble 10 per cent	2 „
Civet „ „ 10 „	1 „
Reseda triple extract	500 „
Tincture orris—to produce	1000 „

ROSE.

History.—The charm and delightful fragrance of the rose is known and appreciated the world over to-day. Since earliest antiquity these qualities have led to its being regarded as the queen of flowers, and ancient literature contains many references to its use. Oils and fats saturated with the perfume of roses were used as unguents, and Homer states that Aphrodite anointed the dead body of Hector with such a product.

Theophrastus tells us that the rose perfume was best absorbed by sesame oil because of its viscid nature. He also says that the rose imparts a fragrant scent or sweet taste to wines. There appears to have been some superstition associated with the collection of the fruits of wild roses, for we read in his "Enquiry into Plants," that if they were not gathered while standing to windward there was a danger to the eyes. Pliny describes the luxury in which the Romans lived, and says that their food was either covered with rose petals or sprinkled with rose perfume.

In Egypt the rose was equally popular, for we are told that men of rank had their mattresses filled with rose petals. It appears probable that rose water was first used in that country, for not only do we read that canals encircling the gardens of the Grand Mogul were filled with it, but that the Princess Nourmahal was rowed about in a tank containing rose water. The separation of an oily substance was noticed about this time, but there appears to be no

definite reference to its preparation—commercially—until the fourteenth century.

Roses evidently played an important part in the magic of ancient antiquity, for we learn on reading the metamorphoses (The Golden Ass) of the Roman jester, Lucius Apuleius, that while journeying through Northern Africa he committed some trifling indiscretion, and because of this was turned into an ass by a witch. The only way he could regain his human form was by *eating* roses.

It was to be expected that a product so much esteemed as rose water would soon become an article of trade, and during the eighth or ninth centuries the Arabs are stated to have sent it as far as India and China. The principal centre of this industry during the middle ages was Persia, but during the tenth century the Arabs appear to have introduced their art into Southern Europe (probably Spain). About the seventeenth century rose cultivation spread to India, Northern Africa, and Turkey, and at approximately this period, the town of Kazanlik was founded, and is to-day the centre of the Bulgarian rose industry.

In more recent years the plant was cultivated in England, France, and Germany, but the commercial distillation of the oil was not begun in France until the end of the nineteenth century. Previously the flowers had been grown for sale, and in some cases were used for the production of fragrant rose water. The large quantities of blossoms which were then wasted are now, as above stated, turned to some commercial account.

Since its first production, attar of roses has been much esteemed as a perfume, and up to a few years ago the demand was generally greater than the supply. In consequence sophistication was much practised both by manufacturers and dealers, and among the articles used for this purpose were palmarosa and ginger-grass oils and spermaceti. Nowadays this practice has been brought to a fine art, and really *pure* otto is seldom purchased.

Flower Varieties.—According to ancient mythology the rose was originally white in colour, and the red varieties

FIG. 45.—The Rose Fields in Provence.

[*Antoine Chiris.*

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[*Pilar Freres.*

FIG. 46.—Collecting Roses at Hyères.

[*Roure-Bertrand Fils.*

FIG. 47.—Sorting Roses.

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were created when a rose-thorn pierced the foot of Venus, the blood escaping from the wound being supposed to have dyed the petals! At the time of Theophrastus it is certain that *some* different varieties existed, for he describes many physical differences and refers to the perfume. Pliny also distinguished them one from another by similar comparisons. Nowadays, on referring to horticultural catalogues, we find thousands of varieties of roses listed under as many different names. It appears probable that a large number of these are the fancy of the florist and have no scientific botanical classification, in some cases a grower having given another name to a hybrid which had previously been discovered by some one else.

Over two hundred species have been named, but it is doubtful if more than one-sixth of this number are specifically distinct. Of the roses which are natives of these islands about twenty are said to belong to England, four to Scotland, one to Ireland, and one to the Scilly Isles. According to the "Hortus Kewensis," these are made to form seven distinct species, the most delightful wild rose being the sweet briar or eglantine, *Rosa rubiginosa* or *R. eglantina*, whose fragrance is especially charming after a shower of rain.

Odour.—Slight differentiations in odour value are not perceptible to every one. The sense of taste is, however, generally more developed, and inconsiderable modifications of flavour are more frequently noticed. To the trained specialist, however, the merest graduation of odour is appreciable, and an expert florist will name the variety of rose *even in the dark*. The real rose odour is unique, and represents a *type* which is undefinable, incomparable, and at present inimitable by synthesis. This type is best represented by *Rosa damascena*, cultivated in Bulgaria, and approximated to very closely by *Rosa centifolia*, cultivated in Provence. There are many variations from this type, and some of the roses which exhibit slightly different floral notes are enumerated below; they represent practically all those that the perfumer is required to imitate:—

R. arvensis, also known as the Ayrshire rose—some varieties are myrrh-scented ; *Banksian*, recalling violets ; *Canina*, resembling mignonette ; *Desprez*, fruity ; *Eglantine*, whose leaves recall jasmin ; *Macartnean*, apricots ; *Marechal Niel*, the most delightful of the "tea" class, having a somewhat fruity odour, resembling raspberry ; *Moschata*, growing wild in Tunis and believed by some to be musky and by others to resemble pinks ; *Muscosa*, moss scented ; *May*, recalling cinnamon ; *Safrano*, recalling pinks ; *Socrates*, resembling the peach ; *Souveraine*, the melon ; *Unique jaune*, the most charming of the "noisette" type and having an odour of hyacinths. In the majority of cases red roses are more odoriferous than white ones, but a peculiarity possessed by a number of both kinds is that, when cut and placed in water, their fragrance appears more pronounced than when growing. Roses cultivated in a hot climate have a more powerful perfume, and it has been noticed that those flowers grown under glass develop a finer aroma than those which thrive in the open air. Some roses, *e.g. R. gallica*, develop their perfume when dried, while others, *e.g. R. damascena*, lose it under similar circumstances. Sawer states [1] that before a storm the odour of a rose *seems* strangely increased, and suggests that this may be due to the oxidising influence of the ozone in the atmosphere or to the perceptive faculties being sharpened at such moments. Other peculiarities of the rose odour are (*a*) that no two flowers emit the same fragrance ; (*b*) that different flowers from the *same* plant have never *exactly* the same perfume.

Natural Perfume.—The finest and most delicate form in which the rose perfume can be obtained is undoubtedly the *otto*, which is a product of distillation. Unfortunately, however, owing to the loss of phenylethyl alcohol, a large proportion of which remains dissolved in the rose water, the otto does not accurately represent the flower odour. This is more nearly approximated to by the "absolute"

[1] "Odorographia" (1892), 24.

[*Photo, Parfumerie Moderne, Lyon.*

Fig. 48.—Field of "Drusky" Roses at Arma di Taggia (Italy).

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[*Photo, Parfumerie Moderne, Lyon.*

FIG. 49.—Workmen returning to the Factory Garnier at Kazanlik.

[*Photo, Parfumerie Moderne, Lyon.*

FIG. 50.—Rose Extraction by Volatile Solvents.

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obtained by means of volatile solvents, which method is largely employed in the south of France and to some extent in Bulgaria (see Fig. 50). The perfume is also extracted in the form of pomade by maceration. Different roses grown in different districts produce ottos having entirely different odoriferous characteristics. This is ably illustrated by a comparison of the Bulgarian with the French. The former has a sweeter, fuller, and more honey-like bouquet, while the latter perfume resembles that of dried rose leaves and is about half the price. In Bulgaria practically all the otto comes from *Rosa damascena* and possibly some from *R. alba*. The former is not known in the wild state, but is a product of horticulture, the original plant being presumably a hybrid between *R. gallica* and *R. canina*. In the Kazanlik district the damask rose is planted in the fields and the white rose in the hedgerows. The flowers are usually collected before they begin to open and a little in advance of sunrise. Those which are gathered later in the day emit a more powerful fragrance of less delicacy, and the resulting distillation product is not so sweet in consequence. The white rose is said to yield an otto with a higher percentage of stearoptene, and its use is denounced by certain authorities. In spite of this fact, however, some manufacturers add it to the red roses in the still, as it is believed to facilitate the addition of adulterants and at the same time complicate their detection. *R. damascena* is also cultivated in India and Persia, but the principal variety grown in Provence, Tunis, and Asia Minor is *R. centifolia*.

Generally in commerce rose otto is distinguished according to its geographical source, Bulgarian, Anatolian, French, etc., and also according to its make. One kilo of oil is obtained by distillation from the following weight (approximate) of flowers :—

1. Bulgaria	. . . .	3,500 kilos
2. Anatolia	. . . .	4,000 „
3. France	. . . .	20,000 „

The low yield obtained in the South of France is probably due to the fact that the blossoms are distilled primarily for *rose water* and the oil considered a by-product.

The principal differences are due to the variation in flowers employed and to the district in which they are grown. The following constituents have been identified[1] in commercial samples of rose oil :—

Geraniol	up to 75 per cent
Citronellol	about 30 „
Nerol	up to 10 „
Phenylethyl alcohol	about 1 „
Esters of geraniol	up to 3·5 „
Eugenol	„ 1 „
l-Linalol, Farnesol, Nonyl aldehyde, Citral	traces

A stearoptene is also present up to 35 per cent in normal Bulgarian oils, but some German and French samples have shown a much higher content. This stearoptene consists of two or more solid hydrocarbons, having melting-points about 22° C. and 40° to 41° C.

The characteristic odour of the genuine otto is probably due to the higher aliphatic aldehydes and is also influenced by the esters of geraniol and citronellol. Some workers maintain that farnesol is responsible for the peculiar honey-like odour of the Bulgarian oil, but the addition of this body to synthetic rose ottos does not reproduce it. The two alcohols, geraniol and citronellol, while present in large proportions, have a comparatively weak odour and lack the powerful tone of the natural product.

Rose otto, as we have said, is prone to sophistication, and the guarantee of a reliable house should always be insisted upon. The risk is minimised to some extent by the purchase of *original vases* bearing the manufacturer's

[1] Various workers through Gildemeister and Hoffmann, "Volatile Oils," II., 568.

[*Photo, Parfumerie Moderne, Lyon.*

FIG. 51.—Construction of Boilerhouse at Kazanlik.
Note the stills on the right.

[*Photo, Parfumerie Moderne, Lyon.*

FIG. 52.—Rose cultivation at Ralimanlare (Bulgaria).

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[*Photo, Parfumerie Moderne, Lyon.*

Fig. 53.—Rose cultures at Ralimanlare (Bulgaria).

[*Photo, Parfumerie Moderne, Lyon.*

Fig. 54.—Distilling Apparatus for Otto of Roses. Garnier's works at Kazanlik.

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seal and number, but should there be any grave reason to doubt the genuineness of a sample, chemical analysis by a specialist is desirable. In this connection, however, it may be of interest to quote Dr. G. Blanc,[1] who states that "there is no use concealing the fact that a chemical analysis cannot prove adulteration in essences of roses or neroli."

Synthetic Otto.—Pseudo-rose oils are now manufactured on a large scale, and they vary in price according to the amount of genuine natural otto contained, for it is admitted that the reproduction of the true odour is impossible at present by means of known synthetic aromatic chemicals alone. The field from which the constituents may be chosen is a large one, since the esters of all the basic alcohols are now obtainable in a wide range, and also the higher alcohols and aldehydes are made in greater purity. Of the bases, **rhodinol** is unquestionably the finest, for its odour approximates more nearly to that of otto than any other alcohol. Geraniol from palmarosa oil, nerol, and citronellol are also good, while terpeneless oil of rose geranium (French) is a very valuable base. Linalol is also much employed, but it has a tendency to modify the odour to that of special type rather than the true aroma. **Phenyl ethyl alcohol** is indispensable in all compounds and is used up to 25 per cent. Of the modifiers, the esters of the above alcohols are all used, but the **acetate** and **formate** of either rhodinol or citronellol are recommended in preference to all others; their odour is finer, but additions should be made in very small quantities until the desired balance is obtained. In no case should they exceed 10 per cent, and in most cases less than half this quantity is sufficient. The most valuable aldehydes are represented by C_9 and C_{10}, and their corresponding alcohols are also useful. Octyl aldehyde has been recommended as being superior to nonyl aldehyde, but practical results do not confirm this. Mere traces of these powerful products are sufficient, and about $\frac{1}{2}$ per cent is the best proportion.

[1] "American Perfumer" (1922), 122C.

The basic rose oil is completed by the addition of one or more of the suitable fixers recommended in the chapter on that subject and by the judicious use of the natural product. A good deal of "body" may also be imparted by the inclusion of a suitable quantity of benzyl iso-eugenol. When the synthetic rose base has been compounded it should be allowed to mature for at least one month, when the rough edges will have disappeared. If any difficulty is experienced in this direction the admixture of 0·5 per cent of oil of clary sage will do much to improve the product. The creation of special types is best accomplished by adding the necessary modifiers to the basic rose oil, and in almost all cases *traces* will be found sufficient. The following list will indicate the lines on which to proceed :—

R. Banksian	Alpha ionone or orris oil.
Canina	Basil oil or ethyl decine carbonate.
Desprez	Ethyl cinnamate or rhodinyl butyrate.
Eglantine	Benzyl acetate and hydroxy-citronellal or phenylethyl acetate and rhodinyl acetate.
Marechal Niel	Guaiac wood oil and aldehyde C_{14} or iso-butyl acetate.
Moschata	Iso-eugenol.
Muscosa	Oakmoss resin (colourless).
May	Cinnamic aldehyde.
Socrates	Aldehyde C_{14}.
Unique jaune	Phenylacetic aldehyde or cinnamic alcohol.

The following formulæ will give a general indication of the composition of specific types :—

Rose de Bulgarie.

Rhodinol	400 c.c.
Nerol	150 „
Geranium oil, terpeneless—French	50 „
Phenylethyl alcohol	200 „
Benzyl iso-eugenol	20 grams
Rose otto—Bulgarian	150 c.c.
Aldehyde C_9	5 „
Alcohol C_{10}	5 „
Rosindol	20 grams

Rose de Provence.

Nerol	250 c.c.
Citronellol	100 „
Geraniol from palmarosa oil	200 „
Linalol	85 „
Phenylethyl alcohol	250 „
Citronellyl acetate	10 „
Aldehyde C_9	4 „
Vetivert oil—English	1 „
Rose Provence, distilled	100 „

Rose Rouge.

Rhodinol	450 c.c.
Rose geranium oil, terpeneless	90 „
Phenylethyl alcohol	220 „
Nonyl aldehyde	5 „
Nonyl alcohol	4 „
Citral (from lemon oil)	1 „
Musk ketone	10 grams
Cinnamic alcohol	20 c.c.
Virgin otto—Bulgarian	200 „

Rose Blanche.

Geraniol from palmarosa oil	500 c.c.
Citronellol	300 „
Hydroxy-citronellal	25 „
Patchouli oil—English	9 „
Vetivert oil—English	1 „
Octyl aldehyde	5 „
Nonyl alcohol	10 „
Rose oil—Bulgarian	150 „

Rose d'Orient.

Rhodinol	400 c.c.
Citronellol	200 „
Nerol	130 „
Ethyl cinnamate	10 „
Benzyl acetate	18 „
Aldehyde C_{16}	2 „
Nonyl alcohol	30 „
Decyl aldehyde	10 „
Benzoin R.	100 „
Otto virgin	100 „

NOTE.—Any of the above synthetic rose ottos can be solidified by the addition of 10 per cent of *cetaceum*.

Alcoholic Perfumes.—A good triple extract can be made by dissolving up to 50 c.c. of any of the above compounds in a litre of the following mixture—the whole being matured six months :—

A.

Musk extract natural 10 per cent .	1 c.c.
Civet „ „ 10 „ .	1 „
Benzoin R.	8 „
Rose water, triple	90 „
Alcohol 95 per cent . . .	900 „

B.

Other formulæ are :—

Rose otto, virgin	5 c.c.
Geranium oil—Grasse . . .	5 „
Rose extract, triple . . .	950 „
Tincture of musk	40 „

C.

Bois de Rose oil	9 c.c.
Patchouli oil	1 „
Rose otto—Bulgarian . . .	5 „
Musk extract soluble 10 per cent .	5 „
Civet „ „ 10 „ .	10 „
Rose extract, triple . . .	970 „

TRÈFLE.

The Plant.—The common red clover *Trifolium pratense*, N.O. Leguminosæ, is grown extensively in our pastures as a food for cattle. There are several varieties, by some botanists considered as distinct species, and many of them are mentioned by Theophrastus and other ancient writers. The most popular garden variety is *T. incarnatum*, the carnation or scarlet clover, and the odour exhaled by its charming flowers has led to the creation of many perfumes bearing the name. Another variety possessing a beautiful honey-like fragrance is *T. odoratum*, a native of Italy. Other varieties are :—

T. medium, the zig-zag clover.
T. hybridum, the alsike clover.
T. repens, the white or Dutch clover.

T. pennsylvanicum, a native of the United States, resembling the latter, and extensively grown in this country, large quantities of seeds being imported annually from America.

Synthetic Otto.—The basis of many trèfle perfumes is amyl salicylate, and this may be used up to 60 per cent of the total. Iso-butyl salicylate is a similar body which may replace it and can be used in like proportions. The blenders and modifiers include ylang-ylang, bergamot or linalyl acetate, oakmoss, and clary sage. A floral note is obtained with benzylidene acetone, rose, tuberose, jonquille, and/or jasmin, while suitable fixators may be chosen from benzoin, tolu, dimethyl hydroquinone, coumarin, vanillin, musk, and phenylacetic acid. Formulæ illustrating the use of the bodies are given below :—

Trèfle.

A.

Amyl salicylate	500 c.c.
Ylang-ylang oil—Manilla	100 „
Bergamot oil, terpeneless	75 „
Clary sage oil	125 „
Mousse de chêne	40 „
Benzylidene acetone	10 grams
Tuberose absolute	30 c.c.
Benzoin R.	100 „
Musk extract soluble 10 per cent	20 „

B.

Iso-butyl salicylate	600 c.c.
Cananga oil, terpeneless	150 „
Linalyl acetate	100 „
Oakmoss resin	50 „
Lavender oil—French	40 „
Phenylacetic acid	10 grams
Coumarin	10 „
Rose	10 c.c.
Jasmin	10 „
Clary sage oil	20 „

Alcoholic Perfumes may be compounded from either of the above floral oils or on the lines indicated below :—

C.

Trèfle synthetic "B."	10 c.c.
Ylang-ylang oil—Manilla	2 „
Vanillin	3 grams
Neroli oil—bigarade	1 c.c.
Musk extract soluble 10 per cent	2 „
Benzoin R.	2 „
Tuberose triple extract	400 „
Jonquille „ „	180 „
Jasmin „ „	400 „

D.

Amyl salicylate	5 c.c.
Bergamot oil	1 „
Lavender oil	1 „
Cananga oil	1 „
Clove oil	1 „
Orange blossom triple extract	200 „
Cassie triple extract	40 „
Oakmoss resin, colourless	1 „
Clary sage oil	0·5 „
Jasmin extract triple	250 „
Tuberose „ „	500 „

TUBEROSE.

The Plant.—*Polianthes tuberosa* belongs to the N.O. Liliaceæ, and is believed to be a native of the East Indies. It was introduced to the south of Europe centuries ago, and is at present largely cultivated in Italy for its bulbs, which form an article of trade and are exported to this and other countries. It was first cultivated in Britain about the year 1630, and is sometimes called *Hyacinthus tuberosus* and *H. Indicus*. It derives its generic name from *polis* a city and *anthos* a flower, literally, flower of the city, and should not be confounded with polyanthus of the primrose family or with *Narcissus polyanthus*.

The plant has a tuberous rootstock, from which grows an erect stem, 3 or 4 feet high, with a few slender long leaves. In the south of France the roots are planted in April, about

[*Lautier Fils.*

FIG. 55.—Collection of Tuberoses at Grasse.

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1 foot apart, and between each row is left sufficient space for the collector to pass along and pick off each flower as it opens. This occurs about mid-day, and the flowering season lasts from August to the early part of October. In November the roots are removed from the ground and stored in dry sand to preserve them.

Odour.—The flowers of tuberose emit a most delightful fragrance, which in itself is a wonderful bouquet, and has been compared with the perfume of a well-stocked flower garden at evening close. In the east these white tubular flowers emit a most powerful odour which increases after sunset, and on this account is called by the Malays "Mistress of the Night."

Natural Perfume.—This is extracted generally by enfleurage, as the flower continues to produce odoriferous bodies while in contact with the fat. It is also extracted by means of volatile solvents, and the *absolute* obtained by this means is one of the dearest, if not the most expensive, of all natural flower products. It has been analysed, but no quantitative figures have been published. Among those constituents which have been identified by Hesse and Verley[1] are the following :—

Benzyl alcohol
Benzyl benzoate
Methyl anthranilate
Methyl benzoate
Methyl salicylate
A ketone, called tuberone.

The methyl anthranilate is believed to average about 6 per cent and the ketone 10 per cent.

Synthetic Otto.—The best pseudo-tuberose oils always contain up to 10 per cent of natural flower extract. This forms the *basis* of the perfume rather than the *final blender*,

[1] "Berichte" through "Year Book of Pharmacy" (1903), 166 and 167.

as is often the case with other oils. The blenders which may be added are linalol, benzyl acetate, benzyl alcohol, geraniol, and iso-butyl phenylacetate. The modifiers include ylang-ylang, jasmin, methyl anthranilate, benzyl butyl-oxide, and sometimes traces of para-cresyl phenylacetate. Methyl benzoate or salicylate, when used, should not exceed 5 per cent. Balsam of Peru and floranal are excellent fixators. Formulæ follow :—

Tuberose.

A.

Linalol ex bois de rose	300 c.c.
Benzyl alcohol	200 „
Benzyl propionate	200 „
Eglantine	50 „
Methyl anthranilate	20 „
Benzyl butyl oxide	5 grams
Ylang-ylang oil—Manilla	20 c.c.
Para-cresol phenylacetate	5 „
Peru balsam	100 „
Tuberose absolute	100 „

B.

Geraniol from Palmarosa oil	400 c.c.
Ylang-ylang oil	20 „
Jasmin concrete	40 grams
Neroli synthetic	40 c.c.
Floranal	20 grams
Methyl benzoate	5 c.c.
Iso-butyl salicylate	5 „
Bois de rose oil	300 „
Civet extract soluble 10 per cent	20 „
Styrax R.	50 „
Benzoin R.	50 „
Tuberose absolute	50 „

Alcoholic Perfumes are almost invariably compounded with the natural triple extract and small quantities of ylang-ylang as follows :—

C.

Ylang-ylang oil—Manilla . .	1 c.c.
Vanillin	2 grams
Benzyl iso-eugenol . . .	2 „
Musk extract natural 10 per cent .	2 c.c.
Peru balsam	3 „
Tuberose extract triple—to produce	1000 „

VIOLET.

History.—*Viola odorata* is a perennial herb of the N.O. Violaceæ, native of Britain, and found growing in woods and on the banks of our waysides. It appears to have been a great favourite even as far back as the pre-Christian era, for we find references to it in the works of Theophrastus (400 B.C.) and Ovid (43 B.C.). The latter has given us a story in Book I. of his "Metamorphoses," from which we gather that the violet took its name from Io, the daughter of Inachus. She was loved and ravished by Jupiter and changed by him into a heifer to avoid detection by Juno. Flowers (presumably violets) were caused to grow in the pastures around her in order that her grass might be distinguished from that of other animals. She was driven over the world by a gadfly sent by Juno, and at last came to the banks of the Nile, where she regained her human form. Her son was worshipped in Egypt as Isis. The violet is also mentioned by Horace, Pliny, and Juvenal the Roman satirist. Pliny called the white violet the "first messenger of spring," and he so esteemed its perfume that he placed it immediately after roses and lilies. Mahomet, the prophet, appears to have gone further than this, for he compared the flower to the superiority of El Islam above other religions, while in the Koran he suggests that his superiority over other men is like that of the violet perfume over all others. About the year 1600 Herrick and Rapin enlarged on the possible origin of the flower, but their theories do not appear as probable as the one given above. Within comparatively recent years the violet has been valued on account of its supposed medicinal qualities. The roots

were stated to have emetic properties, and on that account to have been used as an adulterant of ipecacuanha (?) The leaves were used in the form of an infusion, which was applied both internally and externally as a supposed cure for cancer, while even to-day a syrup made from the petals (?) is an ordinary galenical obtainable from any pharmacist.

Sweet violets are nowadays highly prized for their delightful fragrance, both in Europe and the East. In the south of France they are much cultivated for the extraction of their odoriferous constituents, and the blossoms are collected in March and April, while in Palestine the flowers bloom with the hyacinth and narcissus in January, and are used by the native women to adorn their dark tresses.

Varieties.—There are several kinds of violets both single and double, which are finely perfumed, and these include the following :—

Devon, dark blue and very fragrant.

Neapolitan, lavender blue, large double flowers.

The Czar, large deep violet flowers, delightfully perfumed.

Victoria, single deep blue flowers on long stems.

Victoria Regina, larger flowers of a rich violet blue, and most odoriferous.

Odour.—It is doubtful if the perfume of any other flower is as popular as that of the violet, and the odour of cassie blossom is the only one which bears any marked resemblance to it. Orris and costus roots when dried develop an aroma which is similar.

Natural Perfume.—In the south of France violets are generally planted in October, and the best results are obtained when they are grown in the olive groves. The flowers are picked during March and April, and no time is wasted in transporting them to the factories for immediate treatment ; a considerable part of their fragrance is lost if any delay occurs. The perfume is extracted by maceration or by volatile solvents, and the absolutes from either of the resultant products

[*Lautier Fils.*

FIG. 56.—The Collection of Violets.

[*Roure-Bertrand Fils.*

FIG. 57.—Violets ready for Extraction.

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are exceptionally expensive. It is very doubtful if any *absolutely pure* absolute is ever sold. The odoriferous constituents of the violet are not known, and it appears very improbable that any analysis will be made, as the quantity of essential oil present in the flower is infinitesimal. Indeed, it has been said that it would require the best part of a millionaire's fortune to pay for the pomade from which a sufficient quantity of essential oil could be obtained for a reliable chemical analysis to be made by present methods. The presence of ionone or a similar body seems possible as both this material and the natural violet exhibit the phenomenon of benumbing the olfactory nerves.

Synthetic Otto.—The basis of all artificial violet oils is ionone, and for good results it should be as pure as possible and free from citral and acetone. The difference in odour value of the alpha and beta is slight, but quite noticeable to the practised user, and very different results can be obtained with each isomer. Of the two, alpha is most generally used as it is altogether more fragrant, although numerous shades of violet perfume are obtainable by the addition of varying quantities of beta. Methyl ionone is occasionally blended with either of the above ketones and possesses an amber odour which is at the same time softer. The total quantity of ionones in a synthetic violet should not exceed 60 per cent, and when first added the odour will completely disappear. It is quite impossible, therefore, to estimate the value of perfumes containing it until they have been allowed to mature for at least one month. The odour of ionone lacks "body," and the art in its use lies in being able to back it so that it does not lose any of its freshness in a compound. For this purpose there is nothing better than concrete orris oil, plus some benzyl iso-eugenol. The quantities used should be added to the ionone and allowed to blend for some weeks ; in fact it is advisable, where possible, to keep a stock mixture so that the final blend will not require such long maturing. When benzyl iso-eugenol is not available, heliotropin may be used instead, but the resulting perfume

will not be so fine, and smaller proportions are necessary if the odour of the latter body is to be completely covered. Another necessary ingredient which we may legitimately classify as "basic," is methyl heptine carbonate. This body, often called vert de violette, is used to impart the fresh leafy effect at all times so desirable in violet perfumes. Natural violet-leaf absolute (colourless) will, of course, produce oils of truer odour and is an imperative constituent in all high-grade products. This may be used up to about 3 per cent, while the former should not exceed 1 per cent, and usually half the amount will suffice. The blenders and modifiers offer a wide range of choice, and the following may be taken as representative of the most useful. The synthetics include vanillin, floranal, and duodecyl aldehyde. The first two may be employed up to 5 per cent, although much less is often enough, and the last should not exceed 1 per cent. The natural products include both essential oils and flower extracts. The most useful bodies belonging to the former class are ylang-ylang, santalwood, and bergamot, while in the latter are found cassie, jasmin, mimosa, reseda, rose, and tuberose. Of these the first two are most necessary, and for "de luxe" products the use of *natural* absolute is imperative. The proportions of any of them will depend entirely on the type of violet otto the perfumer has in mind, and price, of course, is a great consideration. Generally 10 per cent of cassie and 5 per cent of jasmine is about the maximum, and in the majority of cases less than this will prove effective. The fixation of pseudo-violets is not difficult, since many of the above-mentioned bodies possess distinct fixative qualities. In addition to these should be mentioned orris oleo-resin, benzoin, tolu, cistus, kostus, civet, musk ambrette, and most important of all, clary sage oil. This will help to blend the otto as well as fix it, and in a few weeks a remarkable flower freshness will pervade it, especially if just the right quantity be employed. In conclusion, let us say that where the price to be obtained will allow it, some natural violet absolute should always be used, and for perfection 10 per cent is necessary. The otto containing it

will not only accurately reproduce the odour of the natural flower, but it will be more economical in use and give results which are satisfactory to the manufacturer as well as to the purchaser.

Formulæ illustrating the use of the various raw materials are given below :—

Violette Vera.

Ionone alpha 100 per cent	550 c.c.
Orris oil, concrete florentine	80 grams
Benzyl iso-eugenol	50 „
Floranal	10 „
Ylang-ylang oil—Manilla	20 c.c.
Bergamot oil	40 „
Santalwood oil	40 „
Violet leaf absolute	20 „
Cassie absolute	50 „
Jasmin „	40 „
Violet „	100 „
Clary sage oil	10 „

Parma Violets.

Ionone beta	515 c.c.
Methyl ionone	50 „
Heliotropin	100 grams
Vanillin	20 „
Aldehyde C_{12}	5 c.c.
Methyl heptine carbonate	5 „
Irone	30 „
Ylang-ylang oil—Manilla	25 „
Jasmin concrete	30 grams
Tuberose absolute	30 c.c.
Cassie concrete	40 grams
Orris oleo-resin	50 „
Guaiac wood oil	100 „

Victoria Violets.

Ionone alpha ± beta	500 c.c.
Orris oil liquid	75 „
Rose otto	25 „
Mimosa absolute	10 „
Musk ambrette	10 grams
Benzyl acetate	40 c.c.
Rhodinol	40 „
Cassie absolute	100 „
Violettophyx	200 „

Wood Violets.

Ionone beta 100 per cent	500 c.c.
Heliotropin	100 grams
Orris oil concrete	100 „
Violet leaf absolute	20 c.c.
Aldehyde C_{12}	5 „
Oakmoss resin	25 „
Cananga oil, terpeneless	20 „
Santalol	40 „
Benzyl acetate	40 „
Violettophyx	150 „

Rhine Violets.

Ionone alpha	400 c.c.	
Vanillin	30 grams	
Linalyl acetate	100 c.c.	
Rhodinol	100 „	
Irone	70 „	
Methyl heptine carbonate	25 „	
Terpineol	75 „	
Orris resin	50 „	
Guaiac wood oil	50 „	(melted)
Violettophyx	100 „	

Alcoholic Perfumes of finest quality are generally made by blending natural triple extracts in which violet predominates in quantity. Two examples follow :—

A.

Jasmin absolute	2 c.c.
Oleo-resin orris	1 „
Musk extract soluble 10 per cent	1 „
Civet „ „ 10 „	1 „
Cassie extract triple	200 „
Violet „ „ —to produce	1000 „

B.

Ylang-ylang oil—Manilla	1 c.c.
Ionone alpha	2 „
Cassie absolute	1 „
Tuberose absolute	1 „
Jasmin triple extract	100 „
Rose „ „	100 „
Violette „ „	600 „
Tincture of orris—to produce	1000 „

WALLFLOWER.

The Plant.—*Cheiranthus cheiri*, popularly known as the giroflée, is a perennial plant of the N.O. Cruciferæ and native of southern Europe. It was well known to the ancient Greeks, and is mentioned by Theophrastus (400 B.C.) in his "Enquiry into Plants." The wallflower was introduced to this country nearly 400 years ago, and is now one of the commonest plants cultivated in our gardens. It is the flower with which romance-writers embellish their stories relating to ruins and desolate places. "From the fact that wallflowers grew upon walls and were seen on casements and battlements of ancient castles and among the remains of abbeys, the minstrels and troubadours were accustomed to wear a bouquet of these flowers as the emblem of an affection which is proof against time and misfortune."[1] The plant seldom exceeds a foot in height, and in the natural state the flowers are single and of a yellowish colour. Cultivation has produced various beautifully coloured specimens, and many acres of them are grown to supply the London markets. These should not be confused with the alpine wallflower, the fairy, and the rhoetian wallflower, which belong to the genus Erysimum.

The Natural Perfume is not an article of commerce. The flowers were extracted by E. Kummert[2] with volatile solvents, and after removal of natural waxes, etc., he obtained 0·06 per cent of an oil of disagreeable odour. This chemist established the presence of the following constituents :—

Irone	Salicylic acid
Nerol	Anthranilic acid
Geraniol	Methyl anthranilate
Benzyl alcohol	Indol
Anisic aldehyde	Acetic acid
Linalol	and traces of phenols and lactones.

[1] D. McDonald, "Fragrant Flowers and Leaves" (1895), 23.

[2] "Chem. Ztg.," 35 (1911), 667, through Gildemeister and Hoffmann, "Volatile Oils," II., 533.

Synthetic Otto.—This is compounded on the lines of the analysis given above, using a mixture of geraniol, linalol, anisic aldehyde, and benzyl alcohol as the basis of the perfume. The blenders and modifiers consist of phenyl-ethyl phenylacetate, hydroxy-citronellal, methyl anthranilate, and heliotropin, while the characteristic wallflower note is obtained with *p*-cresol methyl ether. Indol and decyl aldehyde are useful additions. Rose with traces of cassie supply the flowery touch, and fixation is completed with benzoin, Peru balsam, or benzyl iso-eugenol. Formulæ follow :—

Wallflower.

A.

Geraniol from palmarosa oil	200 c.c.
Linalol	50 „
Anisic aldehyde	120 „
Benzyl alcohol	200 „
Methyl anthranilate	42 „
Hydroxy-citronellal	50 „
Heliotropin	80 grams
Para-cresol methyl ether	2 c.c.
Indol	1 gram
Aldehyde C_{10}	5 c.c.
Cassie absolute	50 „
Rose „	100 „
Benzoin R.	50 „
Benzyl iso-eugenol	50 grams

Alcoholic Perfumes may be prepared as follows :—

B.

Wallflower synthetic "A"	15 c.c.
Tuberose extract triple	200 „
Musk extract soluble 10 per cent	5 „
Alcohol 90 per cent—to produce	1000 „

CHAPTER IV.

MISCELLANEOUS FANCY PERFUMES.

1. Non-Alcoholic Concentrates.
2. Well-known Recipes.
3. French Floral Ottos.
4. American Practice.

NON-ALCOHOLIC CONCENTRATES.

UNDER this heading are included formulæ which after maturing will be found useful for perfuming all kinds of toilet articles. In the event of their being required for perfuming brilliantines, etc., where turbidity would result on mixation, the essential oils should be replaced by their *terpeneless* equivalents and the natural absolutes by their *artificial* imitations.

Abronia.

Verbena oil—French	500 grams
Rhodinol	50 „
Irone	50 „
Iso-eugenol	20 „
Heliotropin	80 „
Rose synthetic	40 „
Bergamot oil—terpeneless	50 „
Musk ketone	10 „
Neroli synthetic	50 „
Benzoin R.	100 „
Cistus R.	50 „

Alyxia.

Benzyl acetate	500 grams
Cinnamic alcohol	100 „
Benzyl alcohol	100 „
Rose absolute	40 „
Jasmin absolute	50 „
Aldehyde C_{10}	10 „
Hydroxy-citronellal	100 „
Iso-butyl phenylacetate	50 „
Styrax R.	50 „

Ambre Royale Aux Fleurs.

Diphenyl methane	5 grams
Vetivert oil—English	5 ,,
Salvia sclarea oil	5 ,,
Jasmin absolute	10 ,,
Violet synthetic	25 ,,
Santalwood oil—English	25 ,,
Coumarin	25 ,,
Musk ketone	50 ,,
Floranal	50 ,,
Hydroxy-citronellal	50 ,,
Iso-butyl phenylacetate	50 ,,
Rose oil—Bulgarian	50 ,,
Amber liquid synthetic	50 ,,
Musk extract soluble 10 per cent	50 ,,
Benzoin R.	150 ,,
Benzyl benzoate	150 ,,
Essence ambergris	250 ,,

Ambrosia.

Coumarin	100 grams
Floranal	20 ,,
Oakmoss resin	20 ,,
Iso-butyl salicylate	300 ,,
Dimethyl hydroquinone	10 ,,
Bergamot oil—terpeneless	200 ,,
Lavender oil—English	200 ,,
Ionone beta	20 ,,
Diphenyl oxide	5 ,,
Ylang-ylang oil	25 ,,
Jasmin synthetic	50 ,,
Iso-butyl benzoate	50 ,,

Benzoinette.

Ethyl cinnamate	5 grams
Anisic aldehyde	5 ,,
Vanillin	100 ,,
Coumarin	50 ,,
Tuberose absolute	100 ,,
Rose absolute	200 ,,
Vetivert oil—English	20 ,,
Patchouli oil	10 ,,
Oakmoss resin	10 ,,
Benzyl iso-eugenol	100 ,,
Benzoin R.	400 ,,

Boronia.

Bergamot oil—terpeneless	200 grams
Lemon oil	50 „
Rose synthetic	250 „
Clary sage oil	10 „
Orange blossom absolute	90 „
Tuberose absolute	100 „
Heliotropin	50 „
Muguet synthetic	100 „
Amber liquid	150 „

Bouquet Des Alpes.

Lavender oil—French	400 grams
Bergamot oil	100 „
Geraniol	100 „
Ambrette oil—concrete	25 „
Ylang-ylang oil	25 „
Clary sage oil	25 „
Rosemary oil	25 „
Jasmin absolute	50 „
Benzoin R.	250 „

Bouvardia.

Benzyl propionate	325 grams
Styrone	75 „
Bergamot oil—terpeneless	50 „
Methyl anthranilate	45 „
Indol	5 „
Bois de rose oil	100 „
Phenylethyl phenylacetate	50 „
Tuberose absolute	100 „
Rose absolute	100 „
Hydroxy-citronellal	150 „

Cananga.

Jasmin synthetic	50 grams
Meta-cresol phenylacetate	50 „
Iso-eugenol	20 „
Phenylethyl formate	30 „
Neroli oil	50 „
Jonquille synthetic	100 „
Cananga oil—terpeneless	675 „
Alcohol C_{10}	25 „

Cologne. A.

Neroli oil—bigarade	100 grams
Petitgrain oil—terpeneless	200 „
Lavender oil—French	50 „
Rosemary oil	50 „
Bergamot oil	300 „
Lemon oil	100 „
Portugal oil	100 „
Rose synthetic	50 „
Colognez	50 „

Cologne. B.

Lime oil	40 grams
Nerol	400 „
Salvia sclarea oil	10 „
Bergamot oil—terpeneless	400 „
Coriander oil	20 „
Sweet orange oil	30 „
Verbena oil—French	30 „
Musk ambrette	20 „
Ambrette R.	50 „

Coronilla.

Hydroxy-citronellal	200 grams
Amyl phenylacetate	150 „
Coumarin	100 „
Dimethyl hydroquinone	100 „
Jasmin concrete	100 „
Diphenyl methane	50 „
Rose de mai	100 „
Amber liquid	200 „

Corylopsis.

Ylang-ylang oil—Manilla	300 grams
Benzyl acetate	250 „
Piperonal-vanillone	15 „
Rose de Bulgarie synthetic	130 „
Patchouli R.	50 „
Vetiverol	5 „
Hydroxy-citronellal	100 „
Benzoin R.	150 „

Cyclamen.

Linalol	300 grams
Terpineol	300 „
Muguet synthetic	200 „
Benzyl propionate	50 „
Styrolene acetate	50 „
Violet synthetic	40 „
Aldehyde C_{10}	10 „
Tuberose absolute	20 „
Rose absolute	30 „

Chypre.

Safrole	50 grams
Licareol	350 „
Eugenol	20 „
Ionone	100 „
Clary sage oil	100 „
Oakmoss resin	80 „
Vanillin	20 „
Coumarin	20 „
Heliotropin	40 „
Vetiver R.	20 „
Rose absolute	200 „

Decumaria.

Anisic aldehyde	500 grams
Para-methyl tolyl ketone	25 „
Heliotropin	100 „
Vanillin	75 „
Aldehyde C_{16}	5 „
Benzyl acetate	95 „
Petitgrain oil—terpeneless	75 „
Geranyl formate	25 „
Benzyl iso-eugenol	100 „

Dillenia.

Terpineol	250 grams
Rhodinol	100 „
Bergamot oil	250 „
Cassie absolute	50 „
Orange blossom absolute	50 „
Heliotropin-amorphous	30 „
Musk ketone	20 „
Violettophyx	250 „

Erica.

Phenyl-cresyl oxide	40 grams
Oakmoss resin	30 „
Bergamot oil—terpeneless	200 „
Benzyl iso-eugenol	100 „
Dimethyl hydroquinone	30 „
Oleo-resin orris	50 „
Amber liquid	150 „
Geraniol	200 „
Citronellol	150 „
Rosindol	50 „

Fagonia.

Terpineol	300 grams
Linalol	250 „
Hydroxy-citronellal	150 „
Ylang-ylang oil	60 „
Jasmin synthetic	50 „
Geraniol	140 „
Vanillin	20 „
Civet extract soluble 10 per cent	30 „

Fern.

Betula lenta oil	150 grams
Terpinyl acetate	100 „
Linalyl acetate	200 „
Iso-butyl benzoate	50 „
Jasmin	40 „
Clary sage oil	40 „
Ylang-ylang oil	50 „
Coumarin	150 „
Oakmoss resin	120 „
Benzoin R.	100 „

Gardenia.

Benzyl propionate	250 grams
Benzyl formate	40 „
Benzyl alcohol	100 „
Jasmin concrete	200 „
Tuberose absolute	50 „
Rose absolute	50 „
Phenylethyl alcohol	100 „
Hydroxy-citronellal	200 „
Aldehyde C_{14}	2 „
Phenylmethyl acetate	10 „

Glycine.

Methyl paratolyl ketone	40 grams
Bois de rose oil	260 „
Phenylethyl phenylacetate	200 „
Terpineol	200 „
Phenylpropyl alcohol	50 „
Rose absolute	50 „
Tuberose absolute	50 „
Jonquille absolute	50 „
Balsam Peru	25 „
Benzoin R.	75 „

Hancornia.

Jasmin absolute	80 grams
Tuberose absolute	100 „
Rose de Mai absolute	50 „
Cassie absolute	20 „
Benzyl propionate	250 „
Hydroxy-citronellal	200 „
Dimethyl hydroquinone	25 „
Clary sage oil	25 „
Styrax R.	250 „

Hugonia.

Heliotropin	100 grams
Vanillin	50 „
Ionone alpha	250 „
Orris oil—concrete	50 „
Cassie absolute	25 „
Jasmin absolute	25 „
Aldehyde C_{12}	3 „
Rhodium oil	47 „
Tolu R.	100 „
Cistus R.	50 „
Musk ketone	50 „
Benzoin R.	250 „

Idealia.

Rose synthetic—d'Orient	400 grams
Bergamot oil—terpeneless	250 „
Lavender oil—terpeneless	50 „
Petitgrain oil—terpeneless	90 „
Benzylidene acetone	10 „
Ylang-ylang oil	50 „
Iso-butyl benzoate	50 „
Musk extract soluble 10 per cent	5 „

Idealia *continued.*

Civet extract soluble 10 per cent	5 grams
Iso-eugenol	10 „
Jasmin absolute	40 „
Cinnamic alcohol	40 „

Ismene.

Muguet synthetic	500 grams
Ylang-ylang oil	100 „
Jasmin absolute	50 „
Tuberose absolute	50 „
Vanillin	25 „
Rhodinol	75 „
Olibanum R.	50 „
Opoponax R.	50 „
Aldehyde C_{14}	2 „
Roseophyx	98 „

Jonesia.

Bergamot oil—terpeneless	150 grams
Lemon oil—terpeneless	30 „
Lime oil—terpeneless	20 „
Verbena oil—terpeneless	100 „
Neroli oil—bigarade	100 „
Bois de rose oil	200 „
Terpineol	200 „
Elemi R.	30 „
Myrrh R.	30 „
Benzyl formate	20 „
Geranyl formate	20 „
Benzoin R.	100 „

Kleinhovia.

Mimosa absolute	25 grams
Cassie absolute	50 „
Reseda absolute	25 „
Orange blossom absolute	50 „
Jasmin absolute	50 „
Violet synthetic	300 „
Rose synthetic	200 „
Duodecyl alcohol	50 „
Oleo-resin orris	50 „
Heliotropin	200 „

Lælia.

Iso-butyl salicylate	200 grams
Amyl salicylate	300 „
Oakmoss resin	25 „
Labdanun R.	25 „
Coumarin	150 „
Dimethyl hydroquinone	20 „
Linalyl acetate	180 „
Lavender oil	50 „
Tarragon oil	5 „
Methyl heptine carbonate	5 „
Iso-butyl phenylacetate	40 „

Lime Blossom.

Tilleul extra conc.	700 grams
Ylang-ylang oil	80 „
Terpineol	100 „
Heliotropin	40 „
Patchouli oil—English	10 „
Styrolene acetate	10 „
Rose absolute	20 „
Jasmin absolute	20 „
Musk ambrette	18 „
Para-methyl tolyl ketone	2 „

Monimia.

Grasse geranium oil—terpeneless	300 grams
Ylang-ylang oil	200 „
Heliotropin	100 „
Vanillin	100 „
Oeillet absolute	25 „
Jasmin synthetic	50 „
Patchouli oil	50 „
Oakmoss resin	25 „
Rose absolute	30 „
Orange flower absolute	20 „
Benzyl benzoate	100 „

Nemesia.

Methyl ionone	125 grams
Rose synthetic	100 „
Cistus R.	75 „
Bergamot oil—terpeneless	100 „
Jasmin	100 „
Floranal	50 „

Nemesia *continued.*

Coumarin	50 grams
Musk ketone	40 „
Amber liquid	260 „
Linalol	80 „
Meta-cresol phenylacetate	20 „

Opoponax. A.

Bergamot oil	250 grams
Rose synthetic	250 „
Santalwood oil—English	100 „
Citral	5 „
Musk ketone	25 „
Heliotropin	50 „
Vanillin	50 „
Vetivert oil—English	50 „
Patchouli oil	20 „
Amber liquid	200 „

Opoponax. B.

Bergamot oil—terpeneless	300 grams
Orris oil liquid	50 „
Opoponax R.	50 „
Lemon oil—terpeneless	20 „
Jasmin extra	50 „
Rose	80 „
Ginger oil	10 „
Myrrh R.	50 „
Galbanum R.	40 „
Encens R.	25 „
Violet synthetic (leafy)	50 „
Vetivert oil	25 „
Cistus R.	50 „
Amber liquid	200 „

Passiflora.

Amber liquid	370 grams
Coumarin	100 „
Floranal	100 „
Hydroxy-citronellal	200 „
Aldehyde C_{14}	5 „
Dimethyl hydroquinone	100 „
Iso-butyl phenylacetate	100 „
Clary sage oil	25 „

Pavetta.

Vetivert oil—English	40 grams
Patchouli oil—English	60 „
Santalwood oil	100 „
Rose geranium oil	200 „
Musk extract soluble 10 per cent	25 „
Civet „ „ 10 „	25 „
Benzyl iso-eugenol	100 „
Coumarin	100 „
Heliotropin amorphous	50 „
Bois de rose oil	200 „
Benzoin R.	100 „

Randia.

Benzyl acetate	400 grams
Hydroxy-citronellal	200 „
Phenylacetic aldehyde	50 „
Ylang-ylang oil	50 „
Linalol	100 „
Aldehyde C_9	10 „
Alcohol C_{10}	40 „
Cinnamyl cinnamate	50 „
Styrax R.	100 „

Robinia.

Methyl acetophenone	100 grams
Methyl anthranilate	100 „
Anisic aldehyde	200 „
Iso-butyl benzoate	100 „
Jasmin absolute	50 „
Tuberose absolute	50 „
Orange blossom absolute	30 „
Geranyl formate	20 „
Phenylethyl phenylacetate	150 „
Tolu R.	50 „
Galbanum R.	50 „
Benzoin R.	100 „

Santolina.

Lavender oil—French	400 grams
Bergamot oil	100 „
Ylang-ylang oil	75 „
Salvia sclarea oil	25 „
Oakmoss resin	10 „
Ambrette R.	40 „

Santolina *continued.*

Vetivert R.	50 grams
Cassie absolute	50 „
Rose synthetic	150 „
Benzoin R.	100 „

Stephanotis.

Piperonal-vanillone	250 grams
Phenylethyl acetate	250 „
Para-cresol phenylacetate	25 „
Coumarin	40 „
Rhodinol	60 „
Musk ambrette	25 „
Civet extract soluble 10 per cent	10 „
Cassie absolute	30 „
Jasmin „	30 „
Jonquille „	30 „
Tuberose „	50 „
Amber liquid	200 „

Syringa.

Hydroxy-citronellal	250 grams
Vanillin	50 „
Para-cresol phenylacetate	40 „
Jasmin absolute	100 „
Tuberose absolute	200 „
Orange blossom absolute	250 „
Styrax R.	100 „
Aldehyde C_{10}	10 „

Tinnea.

Duodecyl alcohol	50 grams
Ethyl decine carbonate	50 „
Irone	100 „
Methyl ionone	200 „
Benzyl iso-eugenol	100 „
Santalwood oil	100 „
Ylang-ylang oil	100 „
Musk ketone	50 „
Vanillin	50 „
Rose synthetic	200 „

WELL-KNOWN RECIPES.

The following formulæ represent the approximate equivalent, expressed in terms of *Absolute flower oil* for

many popular alcoholic handkerchief perfumes, recipes for which have been published.

Experiment will show the proportion of spirit required for their dilution.

À la Mode.

Benzaldehyde	45 grams
Nutmeg oil—expressed	35 „
Cassie absolute	220 „
Jasmin concrete	220 „
Orange blossom absolute	220 „
Tuberose absolute—liquid	220 „
Civet extract soluble 10 per cent	40 „

Bouquet des Fleurs.

Bergamot oil	240 grams
Lemon oil	120 „
Portugal oil	120 „
Violet synthetic	150 „
Tuberose absolute	150 „
Rose synthetic	150 „
Benzoin R.	70 „

Bouquet d'Esterhazy.

Neroli oil—bigarade	250 grams
Orange flower absolute	250 „
Rose absolute—by volatile solvents	250 „
Clove oil	50 „
Santalwood oil	50 „
Coumarin	40 „
Vanillin	10 „
Vetivert oil—English	10 „
Oleo-resin orris	40 „
Amber liquid	50 „

Buckingham Flowers.

Rose de mai—absolute	200 grams
Jasmin synthetic	200 „
Cassie absolute	200 „
Orange flower concrete	200 „
Oleo-resin orris	50 „
Rose otto—Bulgarian	50 „
Neroli oil petale	30 „
Lavender oil—English	30 „
Amber liquid	40 „

Essence Bouquet.

Petitgrain oil	160 grams
Sweet orange oil	160 „
Rose concrete	140 „
Jasmin extra	130 „
Lavender oil—French	120 „
Lemon oil	80 „
Neroli synthetic	80 „
Rose oil—Bulgarian	25 „
Thyme oil—white	25 „
Palmarosa oil	20 „
Clove oil	20 „
Cassia oil	20 „
Musk extract soluble 10 per cent	20 „

Eau de Berlin.

Aniseed oil	150 grams
Bergamot oil	480 „
Cardamon oil	20 „
Coriander oil	15 „
French geranium oil	30 „
Lemon oil	30 „
Melissa oil	20 „
Neroli oil	75 „
Rose oil—Bulgarian	40 „
Santalwood oil	30 „
Thyme oil—white	20 „
Ethyl phthalate	90 „

Frangipanni.

Bergamot oil	60 grams
Cassie concrete	200 „
Civet extract soluble 10 per cent	50 „
Geranium oil—French	80 „
Musk extract soluble 10 per cent	50 „
Neroli oil	72 „
Orange blossom absolute	120 „
Rose otto	40 „
Rose concrete—Provence	200 „
Santalwood oil	10 „
Coumarin	60 „
Vanillin	58 „

Horse-Guard's Bouquet.

Rose de mai—absolute	700 grams
Orange flower concrete	150 ,,
Iso-eugenol	60 ,,
Oleo-resin orris	30 ,,
Vanillin	20 ,,
Musk ambrette	40 ,,

Hovenia.

Iso-eugenol	340 grams
Lemon oil—terpeneless	210 ,,
Petitgrain oil—terpeneless	225 ,,
Rose synthetic	225 ,,

Japanese Bouquet.

Cedarwood oil	160 grams
Patchouli oil	160 ,,
Santalwood oil	160 ,,
Verbena oil—French	160 ,,
Vetivert oil	80 ,,
Rose otto—Provence	280 ,,

Jockey Club.

Bergamot oil—super	160 grams
Jasmin absolute	200 ,,
Rose synthetic	300 ,,
Tuberose concrete	140 ,,
Mace oil—concrete	160 ,,
Civet extract soluble 10 per cent	40 ,,

Kiss Me Quick.

Cassie absolute	200 grams
Amber liquid	50 ,,
Jonquille synthetic	400 ,,
Para-cresyl phenylacetate	10 ,,
Coumarin	20 ,,
Orris resin	20 ,,
Civet extract soluble 10 per cent	40 ,,
Rose absolute	200 ,,
Citronella oil	40 ,,
Lemon-grass oil	20 ,,

Leap-Year Bouquet.

Jasmin absolute	300 grams
Patchouli oil	20 „
Santalwood oil	150 „
Tuberose absolute	200 „
Verbena oil—French	30 „
Vetivert oil—English	150 „
Rose concrete	150 „

Bouquet a la Maréchale.

Neroli oil—bigarade—extra	100 grams
Orange blossom absolute	200 „
Coumarin	80 „
Vanillin	80 „
Orris oil concrete—Florentine	80 „
Vetivert oil	100 „
Rose oil—Anatolian	200 „
Clove oil	40 „
Santalwood oil	40 „
Musk extract soluble 10 per cent	40 „
Amber liquid	40 „

Millefleur Bouquet.

Cassie absolute	60 grams
Cedarwood oil	60 „
Jasmin synthetic extra	80 „
Neroli oil—bigarade	60 „
Patchouli oil	60 „
Vanillin	60 „
Violet synthetic	60 „
Vetivert oil	60 „
Lemon oil	80 „
Rose geranium oil	120 „
Lavender oil—French	120 „
Sweet orange oil	80 „
Musk extract soluble 10 per cent	50 „
Civet „ „ 10 „	50 „

Musk.

Musk ambrette	200 grams
Musk ketone	200 „
Ionone beta	50 „
Vetivert oil—terpeneless	50 „
Santalwood oil	100 „
Benzyl benzoate	400 „

Mousseline.

Cassie synthetic	150 grams
Jasmin	150 „
Rose de Provence	150 „
Tuberose absolute	150 „
Bouquet à la maréchale	200 „
Santalwood oil—English	200 „

Polyanthus.

Rose absolute	300 grams
Jasmin „	150 „
Violet „	75 „
Neroli oil	200 „
Lemon oil	200 „
Musk liquid	75 „

Rondeletia.

Bergamot oil	120 grams
Lavender oil	270 „
Clove oil	150 „
Rose oil—virgin	20 „
Santalwood oil	300 „
Amber liquid	80 „
Vanillin	60 „

Tulip.

Cassie absolute	40 grams
Jasmin concrete	260 „
Rose absolute liquid	135 „
Tuberose absolute	260 „
Orris liquid	260 „
Benzaldehyde	15 „
Neroli synthetic	30 „

Yacht Club.

Orange blossom absolute	200 grams
Jasmin extra	100 „
Cassie absolute	20 „
Santalwood oil	200 „
Vanillin	50 „
Rose de Mai absolute	100 „
Benzoin R.	330 „

FRENCH FLORAL OTTOS.

The following recipes are included so that the reader may obtain some idea of the composition of certain popular French creations. The formulæ have been extracted from the "Agenda du Chemiste-Parfumeur," a work published in 1918 from the pen of our distinguished confrère M. R-M. Gattefossé :—

Amarante.

Muguet synthetic	700 grams
Phenylethyl phenylacetate	50 ,,
Rose synthetic	50 ,,
Santal oil—terpeneless	80 ,,
Musk ketone	25 ,,
Mastic	25 ,,
Labdanum resinodor	25 ,,
Jasmin absolute	25 ,,
Muguet absolute	20 ,,

Bouquet de Pompeii.

Geranyl acetate	100 grams
Bergamot oil—terpeneless	200 ,,
Musk ambrette	60 ,,
Vanillin	60 ,,
Olibanum resinodor	200 ,,
Fleur d'oranger absolute	60 ,,
Cassie absolute	50 ,,
Benzoin resinodor	200 ,,
Rose synthetic	70 ,,
Terpinyl acetate	100 ,,

Camelia.

Ylang-ylang oil	300 grams
Linalol from bois de rose oil	300 ,,
Neroline crystals	75 ,,
Iso-eugenol	125 ,,
Resin iris	50 ,,
Amber liquid 100 per cent	20 ,,
Musk artificial	80 ,,
Jasmin absolute	50 ,,
Fleur d'oranger absolute	50 ,,

Chypre Imperial.

Essence naturelle rose de Mai	10	grams
„ „ violet	5	„
„ „ cassie	5	„
„ „ orange flower	5	„
„ „ tuberose	5	„
„ „ orris concrete	1	„
„ „ sauge sclarée	5	„
„ „ mousse Evernia	10	„
Sassafras oil—terpeneless	12	„
Santalwood oil	5	„
Bergamot oil	10	„
Bois de rhodes oil	2	„
Clove oil	1	„
Canella oil—Chinese	1	„
Aniseed oil	0·1	„
Ambrette oil—concrete	10	„
Rose synthetic	10	„
Vanillin	10	„
Coumarin	5	„
Violet synthetic	5	„

Java.

Geranium—terpeneless	180	grams
Vervain „	200	„
Girofle „	50	„
Bergamot „	130	„
Citral	10	„
Sweet orange—terpeneless	10	„
Terpineol	100	„
Jasmin synthetic	100	„
Musk liquid synthetic	120	„
Peru resinodor	100	„

Parfum des Iles.

Benzyl acetate	100	grams
Iso-eugenol	50	„
Vanillin	200	„
Musk ketone	30	„
Linalol de likari	75	„
Geraniol rose	250	„
Bergamot oil—terpeneless	100	„
Ylang-ylang oil	25	„

Parfum des Iles *continued.*

Rose	25 grams
Cassie	25 „
Jasmin	25 „
Orange blossom	25 „
Benzoin resinodor	70 „

Rêve d'Azur.

Essence naturelle jasmin	15 grams
„ „ cassie	5 „
„ „ orange flower	2·5 „
„ „ rose de Mai	5 „
Vanillin	5 „
Rose Maréchal Niel synthetic	20 „
Orris liquid	1 „
Coumarin	10 „
Narcissus synthetic	2·5 „
Jasmin synthetic	15 „
Ylang-ylang	5 „
Eglantine 100 per cent	10 „
Methyl violette	5 „

Safronal.

Heliotropin	400 grams
Rhodinol	80 „
Coumarin	20 „
Bergamot	60 „
Patchouli	80 „
Iso-eugenol	30 „
Rose synthetic	160 „
Mousse Evernia	10 „
Musk tonquin defatted	10 „
Jasmin absolute	40 „
Rose stearopteneless	30 „
Orris liquid	10 „

AMERICAN PRACTICE.

The following recipes will illustrate the type of perfume manufactured in the United States. They are taken from Walter's "Manual for the Essence Industry," and the triple extracts to be employed are simply designated by the names of the flowers they represent :—

Ambre Royal.

Musk	$\frac{3}{8}$ drachms
Patchouli oil	$\frac{3}{8}$,,
Reseda geraniol	$\frac{3}{4}$,,
Vanillin	$1\frac{1}{4}$,,
Ambergris	$1\frac{1}{2}$,,
Benzyl acetate	$6\frac{1}{2}$,,
Styrax solution	$9\frac{1}{4}$,,
Benzoin solution	12 ,,
Ambergris tincture	2 oz.
Vanillin solution	2 ,,
Musk solution	2 ,,
Jasmin	4 ,,
Rose	4 ,,

Glycinea.

Methyl anthranilate	$\frac{1}{2}$ drachms
Rose oil	$1\frac{1}{2}$,,
Linalyl acetate	3 ,,
Benzyl acetate	3 ,,
Tolu tincture	6 ,,
Musk tincture	10 ,,
Cassie	$3\frac{1}{2}$ oz.
Jasmine	5 ,,
Rose	6 ,,

Indian Bouquet.

Orris oil concrete	$\frac{1}{16}$ drachms
Patchouli oil	$\frac{3}{16}$,,
Ambrette oil	$\frac{1}{8}$,,
Zebithin (10 per cent solution)	$\frac{5}{8}$,,
Musk	$\frac{1}{2}$,,
Ionone	$\frac{1}{2}$,,
Orris tincture	10 ,,
Orange flower	12 ,,
Jasmine	$14\frac{1}{2}$ ozs.

Ki-Loe du Japon.

Ylang-ylang oil	$\frac{1}{8}$ drachms
Orris oil—concrete	$\frac{1}{4}$,,
Vanillin	$\frac{1}{4}$,,
Benzyl acetate	$\frac{5}{8}$,,
Linalyl acetate	$\frac{3}{4}$,,
Terpineol	1 ,,
Guaiacol	$2\frac{1}{4}$,,
Reseda	2 oz. 11 ,,
Rose	6 ,,
Jasmin	7 ,,

Opoponax.

Cinnamon oil	$\frac{1}{8}$ drachms
Ionone	$\frac{1}{8}$,,
Rose oil	$\frac{3}{4}$,,
Opoponax resin	$1\frac{1}{2}$,,
Musk tincture	$3\frac{3}{4}$,,
Benzoin tincture	$1\frac{5}{8}$ oz.
Rose	2 ,,
Orange flower	$2\frac{1}{2}$,,
Jasmin	$2\frac{1}{2}$,,
Orris tincture	3 ,,
Alcohol	4 ,,

Peony.

Methyl anthranilate	$\frac{1}{4}$ drachms
Geranium oil	$1\frac{1}{4}$,,
Musk	$1\frac{1}{4}$,,
Terpineol	$3\frac{3}{4}$,,
Musk tincture	$3\frac{1}{2}$,,
Styrax tincture	6 ,,
Vanillin tincture	$1\frac{1}{4}$ oz.
Orange flower	$2\frac{3}{4}$,,
Jasmin	3 ,,
Violet	4 ,,
Rose	4 ,,

Tulip.

Benzaldehyde	$\frac{1}{16}$ drachms
Neroli	$\frac{3}{16}$,,
Cassie	$11\frac{3}{4}$,,
Rose	$2\frac{1}{4}$ oz.
Jasmin	3 ,,
Tuberose	4 ,,
Orris tincture	6 ,,

CHAPTER V.

TOILET WATERS.

1. Introduction, Honey water, Hungary water.
2. Eau de Cologne, original type, modern prototypes, flower modifications, terpeneless products, cheap Colognes, frozen eau de Colognes.
3. Lavender water, including English and French, amber, terpeneless, and very cheap types.
4. Other popular products, including, Florida water, eau de cananga, and eau de Portugal.

TOILET WATERS.

FRAGRANT waters have been in use since the days of Theophrastus, and are believed to have hygienic qualities not possessed by ordinary handkerchief perfumes. It is difficult to explain their nomenclature, especially since they are generally made with weak alcohol, but, as the diluent usually consists of rose or orange flower *water*, it may be that this, to some extent at any rate, accounts for their designation.

Another distinction is, however, noticeable in nearly all modern formulæ, and this is the absence of any flower *extract*, the principal constituents being either distillation or expression products. In the formulæ which follow, it will be noticed that the *citrus* oils play an important part, even in lavender water, where the best effects are obtained by the liberal use of bergamot oil in conjunction with, of course, either English or French lavender oil.

Honey Water was probably the earliest member of this series, and is said to have been used by the ancient Greeks as a tonic for the hair. In later years it was prepared by

distilling a mixture of honey, gum-arabic, and water, and was employed as a lotion for the face, which it made "white and fair." Nearly all modern formulæ are based on the product originated by George Wilson, who manufactured it for King James II. His recipe for the preparation was approximately as follows :—

Honey	100 grams
Coriander fruit	100 „
Cloves	9 „
Nutmegs	6 „
Gum benzoin	6 „
Storax	6 „
Vanilla pods	6 „
Yellow lemon rind	10 „

Bruise the cloves, nutmegs, coriander-seed, and benzoin, cut the vanilla pods in pieces, and put all into a glass alembic with a litre of French brandy, and after digesting 48 hours, distil. To one litre of the distillate add :—

Damask rose water	150 grams
Orange flower water	150 „
Musk	0·1 „
Ambergris	0·1 „

Grind the musk and ambergris in a glass mortar, and afterwards put all together into a large mattrass and let them circulate three days and three nights in a gentle heat ; let them cool. Filter and keep the water in bottles well stoppered.

Honey water was popularised more recently by Sir Erasmus Wilson, who prescribed it as a hair wash. The following formula will make a pleasantly perfumed product, such as is in demand to-day :—

Aqua Mellis.

Honey	5 grams
Bergamot oil	8 c.c.
Lavender oil—French	1 „
Clove oil	1 „
Nutmeg oil	0·5 „
Coriander oil	1 „

Santalwood oil	3·5 c.c.
Benzoin R.	5 ,,
Musk extract soluble 10 per cent	2 ,,
Rose water triple	100 ,,
Orange flower water triple	100 ,,
Grape spirit	800 ,,

This may be prepared as described under eau de Cologne, when an excellent product will result, but if distilling apparatus is not available the whole should be macerated at least six months and afterwards filtered.

Hungary Water is another *eau de toilette* of comparatively ancient origin, and was prepared mainly from rosemary. The fresh herb was taken and distilled with spirit, variations being sometimes made by the addition of lemon, lavender, or orris. There is very little call for this product to-day, but as it may be of interest the following formula is appended :—

Rosemary oil	20 c.c.
Verbena oil	7 ,,
Portugal oil	1·5 ,,
Limetta oil	1 ,,
Peppermint oil	0·5 ,,
Triple rose water	100 ,,
Triple orange flower water	100 ,,
Alcohol 90 per cent	800 ,,

Mature six months.

EAU DE COLOGNE.

Original Type.—Of all the toilet waters sold to the public, none are so popular as eau de Cologne, for it is known universally. There appears to be some doubt as to the actual origin of this perfume, and according to one version it was invented at Milan by Paul de Feminis, who manufactured it at Cologne in 1690. This gentleman is stated to have given the formula to his nephew, Jean Antoine Farina, who commenced to make it at Paris in

1806, and the manufacture of this particular eau de Cologne is supposed to be continued there to-day by a well-known firm. Another version is that it was invented in 1709 by Jean-Marie Farina, born at Sante-Marie Majeure in Italy, who established himself in Cologne as a perfumer, and whose descendants have continued to preserve the secrets of its manufacture. The word Farina appears on several makes of eau de Cologne, and this is not surprising, since the name is a common one in Italy. At the present time there are two or three perfumers in Cologne who claim to be the original makers of this favourite toilet water. There is one characteristic about all the old-fashioned eau de Colognes, which is, that they represent a *type*, being, more or less, *citrus* bouquets blended with rosemary or lavender. They possess a refreshing and incomparably sweet aroma, which is typical of all the constituents.

The purity and source of the alcohol employed as a solvent for the oils is a factor which contributes materially to the odour of the finished perfume, and a perfectly neutral and highly rectified grape spirit is undoubtedly the most useful for this purpose. If this should not be available, a treble-distilled grain alcohol will make a good substitute. Its method of preparation has been alluded to in the monograph on that subject. The mere traces of œnanthic ether, which are present in these specially prepared raw materials appear to blend well with the oils and slightly modify their odour. The oils used should be selected from the few rather than the many "possibles," and may include neroli, petitgrain, lemon, orange, and bergamot, with the judicious additions of lavender and either rosemary or thyme.

Distillation also plays a most important rôle in the manufacture of "de luxe" products, but *the oil of neroli should always be added afterwards.* This process has a very subtle influence upon the fragrance of the constituents, and an entirely different and finer product results. The reasons for this peculiar change can only be conjectured, but that

some molecular reconstruction of the essential oils takes place on distilling appears to be most probable. When distilling apparatus is not available the oils should be dissolved in the strong alcohol, and the mixture agitated occasionally for a week. The water may then be added little by little, and after further maturing the whole is ready for filtration with talc. Another essential condition in preparing the "de luxe" type is that of maturing the product for at least a year, but with the present duty on alcohol this means the tying up of a considerable sum of money. These difficulties may to some extent be overcome by the addition of $\frac{1}{2}$ per cent of benzoin R., when at the end of one month the bulk will be ready for bottling. The benzoin acts as a fixative, and its odour is not perceptible. Other fixatives are given in the chapter on that subject, but with the exception of benzoin and ambergris they should not be used for the old-fashioned type of eau de Cologne (see *Pre-fixation*, Chap. II., Part II.). Products which closely resemble the original may be made as follows :—

A.

Place in a still—

Bergamot oil—super	8 c.c.
Lemon oil	6 „
Sweet orange oil	5 „
Lavender oil—French	1 „
Orris root—crushed	10 grams
Alcohol 90 per cent	500 c.c.
Water	70 „

Macerate for 24 hours and then distil slowly.
Collect 500 c.c. in the receiver.
To this add—

Neroli oil—bigarade	2·5 c.c.
Rosemary oil	0·5 „
Alcohol 90 per cent	500 „
Benzoin R.	5 „

Mature one month.

B.

Lemon oil	5 c.c.
Bergamot oil	10 „
Portugal oil	5 „

B. *continued.*

Melissa oil	1 c.c.
Rosemary herb	50 grams
Alcohol 90 per cent	1000 c.c.
Water	100 „

Macerate for 12 hours in a still and then distil slowly.
Collect 1000 c.c., in which dissolve—

Neroli oil	2 c.c.
Petitgrain oil—French	3·5 „
Thyme oil—rectified	0·5 „
Oleo-resin orris	4 „

Mature one month.

C.

Neroli oil	5 c.c.
Bergamot oil	12 „
Lemon oil	6 „
Rosemary oil	1 „
Origanum oil	0·5 „
Lavender oil	0·5 „
Orange flower water triple	50 „
Essence ambergris	5 „
Alcohol 90 per cent	950 „

Dissolve the oils in the alcohol and add the essence.
Macerate 7 days, and shake frequently.
Then add 10 c.c. of triple orange flower water each day for 5 days.
Mature for 12 months.
Filter bright, using talc if necessary.

Modern Prototypes are legion, and a fault possessed by many of them is that they are overloaded with the essential oils already mentioned, and these are frequently supplemented by the addition of cinnamon, cloves, etc. While these alterations in formulæ may be appreciated by some, they, nevertheless, so modify the odour that it is often difficult to identify the perfume as eau de Cologne. Many delightful variations may be made without altering the type, and these are accomplished by the addition of rose, and by substituting—

Mandarin	for	Bitter orange
Petitgrain citronnier	„	Sweet orange
Coriander	„	Rosemary
Lime	„	Lemon
Clary sage	„	Lavender

With regard to the last example, it should be noted that *Ol salvia sclarea* is a magnificent and indispensable fixative, and it is doubtful if any other individual essential oil exerts such an influence on the odour and tenacity of eau de Cologne. It requires to be sparingly employed, and should be added with the neroli *after* distillation. The general procedure should not be varied from that outlined above, but any of the fixatives mentioned in the classified list may be added. The following formulæ will indicate the lines upon which several attractive modern prototypes can be manufactured :—

D.

Lime oil—expressed	5 c.c.
Bergamot oil	10 ,,
Portugal oil	7 ,,
Rose oil—virgin	1 ,,
Rosemary oil	1 ,,
Alcohol 90 per cent	1000 ,,
Water	100 ,,

Distil 1000 c.c. in which dissolve—

Neroli oil	2 c.c.
Salvia sclarea oil	0·25 ,,
Benzyl iso-eugenol	1 gram

Mature one month.

E.

Bergamot oil	5 c.c.
Lemon oil	6 ,,
Petitgrain-citronnier oil	7 ,,
Rose geranium oil—French	2 ,,
Lavender oil	1 ,,
Alcohol 90 per cent	1000 ,,
Water	100 ,,

Distil 1000 c.c., and add—

Petitgrain oil—terpeneless	5 c.c.
Neroli oil—bigarade	1 ,,
Colognez	2 ,,

Mature one month.

F.

Coriander oil	1 c.c.
Lime oil—distilled	7 ,,
Mandarin oil	7 ,,
Bergamot oil	15 ,,

F. *continued.*

Thyme oil—white	1 c.c.
Canada snake root oil	0·5 ,,
Alcohol 90 per cent	900 ,,
Water	200 ,,

Distil 1000 c.c., to which add—

Clary sage oil	0·5 c.c.
Vetivert oil—English	1 ,,
Santalwood oil	0·5 ,,
Neroli synthetic	8 ,,

Mature three months.

G.

Lime oil—terpeneless	0·5 c.c.
Sweet orange oil	5 ,,
Bergamot oil	8·5 ,,
Verbena oil—French	1 ,,
Alcohol 90 per cent	800 ,,
Water	300 ,,

Distil 1000 c.c., and add—

Rose geranium oil	5 ,,
Petitgrain oil, French—terpeneless	5 ,,
Ethyl cinnamate	0·25 ,,
Styrax R.	5 ,,

Mature six months, and filter if necessary.

Amber Cologne.

Lemon oil	5 c.c.
Bergamot oil	10 ,,
Mandarin oil	5 ,,
Bois-de-rose oil	5 ,,
Rosemary oil	1 ,,
Alcohol 90 per cent	1000 ,,
Water	100 ,,

Distil 1000 c.c., and add—

Amber liquid B.	10 c.c.
Ethyl cinnamate	0·5 ,,
Salvia sclarea oil	1 ,,
Neroli oil—bigarade	3·5 ,,
Essence ambergris	25 ,,

Mature one month.

Flower Modifications enjoy a distinct popularity and may be classified as follows :—

(1) Those containing the traditional constituents together with the merest floral suggestion. The characteristic

odour of eau de Cologne only is at first apparent, but when the olfactory nerves have become accustomed to it the flower, as it were, takes form, and the effect is both surprising and charming. Mimosa produces one of these most beautiful flower modifications, and will act as a good fixative, especially if the natural concrete is used.

(2) Those which do *not* contain any neroli or petitgrain, but have a very pronounced flowery odour. The perfume first recalls the flower, and afterwards eau de Cologne—in many cases there being no suggestion of the latter at all. This type is well represented by "Trèfle Cologne," where the effect is produced by the use of iso-butyl salicylate, or, when this is not available, by amyl salicylate.

Mimosa Cologne.

Limetta oil—expressed	3 c.c.
Lemon oil	6 ,,
Portugal oil	9 ,,
Bergamot oil	12 ,,
Coriander oil	1 ,,
Alcohol 90 per cent	1000 ,,
Water	100 ,,

Distil 1000 c.c., to which add—

Petitgrain oil	4 c.c.
Clary sage oil	0·5 ,,
[1] Mimosa concrete	10 grams

Mature one month.

Trèfle Cologne.

Bergamot oil	20 c.c.
Lemon oil	5 ,,
Rosemary oil	1 ,,
Lavender oil—French	1 ,,
Ylang-ylang oil	2 ,,
Clary sage oil	1 ,,
Oakmoss resin	1 ,,
Musk extract soluble 10 per cent	3 ,,
Rose synthetic	1 ,,
Iso-butyl salicylate	15 ,,
Coumarin	5 grams
Alcohol 90 per cent	1000 c.c.

Macerate six months.

[1] If this is not available, it can be replaced by para-methyl aceto-phenone.

Terpeneless Oils now play an important part in the manufacture of eau de Cologne, and their use enables the perfumer to employ alcohol of much weaker strength—a very desirable and necessary factor now that the duty on spirit is so excessive. Terpeneless and sesquiterpeneless oils should be chosen with care if really fine products are required, as the difference in odour of various makes—of bergamot, for example—is most striking. The approximate quantities to be used when converting any formula can easily be arrived at by a reference to the table of concentrations given in the dictionary, and these can be accurately adjusted by practice, until the exact reproduction of the odour with dilute alcohol becomes standardised. In order that the quantities of terpeneless oil for *different strengths* of alcohol may be quickly calculated, a table (after Gattefossé) is included on the opposite page.

To facilitate the conversion of a formula from the ordinary to the *terpeneless*, let us take a well-known example. The following was the prize-winner in a competition about 1889, and has been immortalised by the "Chemist and Druggist."

The original is as follows :—

Bergamot oil . . .	2 fluid drachms
Lemon oil	1 „ „
Neroli oil	20 minims
Origanum oil . . .	6 „
Rosemary oil . . .	20 „
Rectified spirit . . .	1 pint
Orange flower water triple .	1 fluid ounce

On changing the quantities of all our oils to minims and dividing by the concentrations 3, 16, 3, 3, and 4 our formula will read :—

Bergamot oil . . .	40 minims
Lemon oil	4 „
Neroli oil	7 „
Origanum oil . . .	2 „
Rosemary oil . . .	5 „
Alcohol 60 per cent . .	1 pint
Orange flower water triple .	1 fluid ounce

The product will not require filtration and will not deposit on standing. Further, we shall have as good a perfume at two-thirds of the cost!

Terpeneless Oil.	Quantity Dissolved by 1000 of Ethyl Alcohol at		
	80 per Cent.	70 per Cent.	60 per Cent.
Angelica	850	25	5
Bay	2500	500	150
Bergamot	1200	300	60
Caraway	1900	300	150
Cardamon	1300	450	80
Citronella	1450	20	3
Cloves	1300	800	300
Coriander	1200	300	200
Dill	1500	500	50
Geranium	1300	300	100
Lavender	1800	350	100
Lemon	1300	35	5
Limes	1200	25	3
Mandarin	1300	15	2
Neroli	1250	300	100
Orange	1200	300	2
Peppermint—Mitcham	950	300	80
„ French	1000	300	15
„ American	900	300	18
„ Japanese	1000	300	60
Petitgrain	1200	300	60
Pimento	3000	800	250
Rosemary	1500	350	150
Thyme	1000	450	100
Verbena	1100	300	100

Cheap Colognes.—Although the toilet waters made with terpeneless oils produce first-class articles at reduced prices, there is a demand in many places for second-grade perfumes. These are prepared :—

1. By the use of iso-propyl alcohol.
2. By employing synthetics or natural isolates.

The solvent power of iso-propyl alcohol at 40 per cent

strength is about equal to that of ethyl alcohol at 80 per cent strength—further, no duty is chargeable on it, and a good quality raw material is almost without any perceptible odour. Synthetics and natural isolates can be easily used in place of many of the oils, as, for example, linalyl acetate for bergamot oil, citral for lemon oil, eugenol for clove oil, and terpinyl acetate for lavender oil. Neroli is best replaced by terpeneless petitgrain oil (French), by beta naphthol ethyl ether, or by methyl naphthyl ketone. Rhodinol or geraniol from palmarosa oil may take the place of rose otto, while, of course, the artificial musks will act as a substitute for their corresponding natural extracts. A very good method of fixing this type of perfume is to digest it for several days with vetivert roots. Two examples of cheap Colognes follow :—

H.

Citral	1 c.c.
Linalyl acetate	9 ,,
Terpinyl acetate	2 ,,
Rhodinol	5 ,,
Menthol	0·5 gram
Musk ketone	1·5 ,,
Iso-eugenol	1 c.c.
Neroli synthetic	10 ,,
Iso-propyl alcohol	500 ,,
Water—freshly distilled—to produce	1000 ,,

Powder the musk and shake with the oils until dissolved. Mix with the iso-propyl alcohol and then gradually add the water, stirring all the time. Add 10 grams of vetivert roots and shake occasionally. Mature one month and then filter.

K.

Bergamot oil—terpeneless	6 c.c.
Citral from lemon oil	1 ,,
Rosemary oil—terpeneless	0·5 ,,
Petitgrain oil—French—terpeneless	10 ,,
Geranyl formate	2 ,,
Beta naphthol ethyl ether	0·5 gram
Iso-propyl alcohol	400 c.c.
Water to produce	1000 ,,

Prepare as directed above.

"Frozen" Eau de Cologne is a novel and convenient form in which this useful and refreshing toilet article may be carried in the hand-bag. It is nothing more than a solid and transparent alcoholic soap, prepared by dissolving high melting-point stearic acid in warm alcohol, to which has been added the oils, and carefully neutralising the solution with soda lye, the end point of the reaction being noted by the use of phenolphthalein. The product is often slightly tinted with a small quantity of chlorophyll or other green dyestuff, and is then run into plated moulds, which are cooled until solidification is effected. The stick should be wrapped in tinfoil or cellophane to facilitate handling, and packed for sale in air-tight tubes. Exceptional cooling effects are obtained by the addition of suitable quantities of peppermint oil.

LAVENDER WATER.

This is undoubtedly England's most famous perfumed *eau de toilette*, and was originally prepared by macerating the fresh flowers in alcohol and then distilling the mixture. Nowadays the best products are made by maceration only for a prolonged period, the essential constituent being *English* lavender oil. The oil used should be of at least 5 years' maturity, and the bouquet of the finished product is much improved by the addition of about one-half of the quantity of bergamot oil. The best fixatives are civet and musk, but they may be replaced by lavendex if desired (see Toilet water fixators). A good formula for this type is as follows :—

I.

Lavender oil—English . . .	20 c.c.
Bergamot oil—super . . .	10 „
Lavendex	5 „
Oleo-resin orris	5 „
Alcohol 90 per cent . . .	1000 „

Mature for *at least six* months and filter if necessary.

Owing to the excessive price of English lavender oil the judicious use of fine quality *French* oil becomes necessary,

and in the latter case ageing of the oil may be dispensed with. The employment of about one-third of the amount of this oil is recommended.

2.

Lavender oil—English	15	c.c.
Lavender oil—French	5	,,
Bergamot oil	10	,,
Clary sage oil	1	,,
Civet extract soluble 10 per cent	4	,,
Orris resin	5	grams
Alcohol 90 per cent	1000	c.c.

Another more elaborate variation of this type is as follows :—

3.

Lavender oil—English	12	c.c.
Lavender oil—Mont Blanc	4	,,
Neroli oil	0·5	,,
Bergamot oil	2	,,
Sweet orange oil	1	,,
Musk extract soluble 10 per cent	1	,,
Civet extract soluble 10 per cent	1	,,
Styrax R.	3	,,
Orris resin	2	,,
Ambrette oil	2	,,
Vanillin	1	grams
Benzyl iso-eugenol	0·5	,,
Alcohol 90 per cent	1000	c.c.

Amber Lavenders.—Some people have a distinct preference for this heavier type of lavender water, and the fineness of the bouquet produced by the English oil is much impaired by the presence of so much civet, etc. A really good French oil is therefore all that is necessary to account for the lavender odour in the perfume. Two formulæ follow :—

4.

Lavender oil—French	25	c.c.
Bergamot oil	5	,,
Civet extract soluble 10 per cent	15	,,
Amber liquid "D"	25	,,
Alcohol 90 per cent	1000	,,

[*By the courtesy of Messrs. Stafford, Allen & Sons.*

Fig. 58.—A Plant of English Lavender.

[*To face page* 316.

5.

Lavender oil—French	20 c.c.
Bergamot oil	10 „
Lemon oil	2 „
Clary sage oil	3 „
Musk ambrette	5 grams
Castor extract soluble 10 per cent	5 c.c.
Essence ambergris	25 „
Alcohol 80 per cent	1000 „

Other Types of lavender water are represented by the following formula, where the introduction of ylang-ylang and jasmin adds a new flower note, and this, together with the slightly camphoraceous odour of the rosemary, produces a very pleasant variation :—

6.

Lavender oil—finest French	25 c.c.
Rose synthetic	5 „
Ylang-ylang oil—Manilla	1 „
Jasmin concrete	1 „
Rosemary oil	2 „
Nutmeg oil	0·25 „
Oleo-resin orris	10 „
Alcohol 90 per cent	900 „
Orange flower water triple	100 „

Add the orangeflower water after the other ingredients have macerated one month. Filter bright if necessary.

Terpeneless Products are easily prepared from any formula by calculating the different quantities of oils that will be required (*see* table in dictionary). The following preparation is a good one :—

7.

Lavender oil—French—terpeneless	10 c.c.
Bergamot oil—terpeneless	4 „
Essence of musk	10 „
Sylvanol	1 gram
Alcohol 60 per cent	1000 c.c.

Macerate with frequent shaking for six months.

Very Cheap lavender perfumes are made by using isopropyl alcohol as solvent : an example follows :—

8.

Lavender oil—terpeneless	12 c.c.
Benzyl acetate	2 „
Phenylethyl alcohol	2·5 „
Bergamot oil—terpeneless	3 „
Vanillin	0·5 gram
Iso-propyl alcohol	500 c.c.
Water, to produce	1000 „

FLORIDA WATER.

Florida water is a popular perfume in America and a native of that country, just as lavender water is of England. It very closely resembles a mixture of eau de Cologne and lavender water to which has been added cinnamic aldehyde and eugenol. The following formulæ will indicate the lines upon which it may be prepared :—

Lavender oil—French	15 c.c.
Portugal oil	5 „
Bergamot oil	25 „
Petitgrain oil—Paraguay	10 „
Eugenol	1 „
Cinnamic aldehyde	1 „
Rose geranium oil	5 „
Oleo-resin orris	2 „
Musk ambrette	1 gram
Orange flower water triple	200 c.c.
Alcohol 90 per cent	800 „

A better product is obtained as follows :—

Neroli oil—bigarade	5 c.c.
Lavender oil—English	5 „
Bergamot oil—super	30 „
Lime oil	2 „
Clove oil	2 „
Cassia oil	3 „
Cinnamon oil	1 „
Rose oil—virgin	5 „
Amber liquid "A"	2 „
Orange flower water triple	100 „
Alcohol 90 per cent	900 „

[*United Drug Co., Boston, U.S.A.*

FIG. 59.—Perfumes stored in "Pfaudler" glass-lined steel tanks. [*To face page* 318.

Eau de Cananga approximates very closely to eau de Cologne, and most formulæ only show a difference in that the neroli is replaced by cananga or ylang-ylang :—

Cananga oil	5	c.c.
Bergamot oil	4	„
Lemon oil	1	„
Benzaldehyde	0·2	„
Musk extract soluble 10 per cent	2	„
Alcohol 80 per cent	1000	„

Eau de Portugal also resembles eau de Cologne, *sine neroli* :—

Sweet orange oil	20	c.c.
Bergamot oil	6	„
Lemon oil	3	„
Rose geranium oil—Vallauris	1	„
Benzoin R.	2	„
Alcohol 90 per cent	1000	„

PART III.

COSMETICS.

"Instead of propagating wallflowers, the rouge pot has nourished the roots of many a family tree, for man has oft and anon been beguiled into matrimony by a pink cheek, and he doesn't really care whether it's the result of wind and weather or of a laboratory, so long as it pleases him.

"As it serves as a worthy commodity of commerce and as an adjunct to beauty, a double function combining the useful and the ornamental, should not the make-up box receive its due and be accorded recognition as a valued member of society?"—Lilian H. Foster, of New York.[1]

[1] "The American Perfumer," October (1922), 346.

CHAPTER I.

BATH PREPARATIONS.

1. Introduction, bath crystals, suitable bases, tinting, dyestuffs, perfumes.
2. Bath tablets.
3. Bath powders.
4. Bath fluids.
5. Bath pot-pourri.
6. Water softeners.
7. Household ammonias.

BATH PREPARATIONS.

In the days when the duty on alcohol was light, and in consequence the cost of eau de Cologne was a fraction of what it is to-day, it was customary for my lady to add a pint or so of this delightfully refreshing perfume to her bath. With the increase in duty, however, it has made the cost of such a luxury prohibitive to all save the wealthy, and as a result the manufacturer of toilet preparations has been called upon to produce something which, whilst retaining the freshness of an alcoholic perfume, will be procurable at a reasonable price. The most popular article to-day which will fulfil these requirements is to be found in the form of **Bath Crystals**. These not only act as a good vehicle for the perfume, but when well tinted they make a most attractive package, which is generally irresistible to the prospective purchaser. In selecting a suitable base for their preparation, it is natural that we should look for something which is as cheap as possible and will at the same time help to soften the water of the bath. The two materials which answer these requirements are sodium carbonate and borax—the former acts chemically on lime salts and precipitates them as $CaCO_3$.

Sodium Carbonate crystallises in large, transparent, monosymmetric crystals, commonly known as "washing soda," having the composition Na_2CO_3 $10H_2O$. On exposure to air these crystals lose their water and effloresce badly, finally falling to powder. This is the principal difficulty which has to be overcome when they are used. In consequence it is customary to employ as a corrective small quantities of glycerine—added to the dye solution. The size of crystal is a matter of personal taste, as the makers will supply anything from the small pea to the large piece half an inch in diameter. The stock should be stored in a cool place, and a damp atmosphere offers no disadvantage.

Borax crystallises in large, transparent prisms, belonging to the monosymmetric system of the composition $Na_2B_4O_7$, $10H_2O$, and does not give up its water so readily as soda. It is, however, more expensive, and a supply of even crystals is less easily obtainable.

Other bases which may be used are **Sodium Sulphate** and **Bay Salt.**

Having selected the most suitable base, our next consideration is that of **Tinting.** For this operation it is necessary to make a dye solution of the requisite strength, which is applied by one of two methods :—

(*a*) By spraying on to the crystals.

(*b*) By immersing the crystals in a tank containing the dye solution.

The first operation is the easiest for small scale productions, while the latter is quickest when large quantities have to be dealt with at a time. *Spraying* possesses the advantage of the operator being able to apply just the right amount of dye solution, when the crystals may be left to dry on trays. *Immersion* has only one disadvantage, which is, that the crystals are much wetter when removed from the bath, and by ordinary draining take a long time to dry. This is easily overcome, however, when centrifugal apparatus is available, and very large quantities can be dealt with daily.

The **Dyestuffs** from which we may choose our colour are given under this heading in the dictionary, but in order to help the operator we will say that the *basic dyestuffs* for cotton yarn are nearly always best, from which the following may be taken as good examples :—

Auramine, for clear yellow shades.
Tartrazine, for lemon tints.
Acridine orange, for orange shades.
Chrysoidine, for warm tangerine tints.
Phenylene brown, for terracottas.
Methylene blues, for various blue shades.
Safranines, for pink tints.
Methyl violets, for purple shades.
Basic greens, for emerald shades.

Of these the blues and greens are not very stable, and good results are only obtainable by the use of *vat dyes*. These are added to the solution of the salt under suitable conditions, and the colour is contained *in* the crystals when formed, developing when they are dried.

A suitable dye solution for *yellow* crystals is prepared to the following formula :—

Auramine	2 grams
Glycerine	50-200 c.c.
Distilled water to produce . .	1000 ,,

Having dyed the crystals a suitable shade, our next consideration is that of **Perfume**. This is the real test of a good bath crystal, as many of them deteriorate in the presence of an alkaline salt. Either essential oils or synthetics may be used, but they should always be mixed with a large proportion of fixative, and nothing answers this purpose better than the resinoids, benzoin, olibanum, vetivert, etc. When essential oils are used, their terpeneless form is most satisfactory, and does not so readily tend to odour decomposition. For example, in **Cologne** bath crystals good results may be obtained with terpeneless petitgrain and bergamot oils, plus some citral and terpinyl

acetate, compounded with benzoin, tolu, or mastic. Such a perfume can be made as follows, and should be matured one month before use :—

Petitgrain oil—French—terpeneless	200 c.c.
Bergamot oil—terpeneless	400 „
Citral	20 „
Terpinyl acetate	80 „
Benzoin R.	100 „
Mastic R.	200 „

Lavender perfumes may be made from the oil plus bergamot, heliotropin, artificial musk, and orris oleo-resin, as follows :—

Lavender oil—terpeneless	500 c.c.
Bergamot oil—terpeneless	200 „
Heliotropin	40 grams
Musk ketone	60 „
Orris oleo-resin	200 c.c.

Verbena bouquets may be compounded from lemon-grass oil, but for "de luxe" products the genuine vervain should be employed. Olibanum makes an excellent fixator :—

Lemon-grass oil	500 c.c.
Geranium R.	300 „
Cistus R.	50 „
Heliotropin	50 grams
Olibanum R.	100 c.c.

Violet and **Rose** perfumes may be conveniently fixed with 25 per cent of violettophyx and roseophyx respectively, while **Oriental** type odours may be compounded with from 10 to 20 per cent of the fixators described under that class, or they may be replaced with fairly large proportions of patchouli R. or vetivert R., according to the type of perfume aimed at.

Pine.—Bath salts may be perfumed with pine oil, but better results are obtained with the following :—

Bornyl acetate	700 c.c.
Terebene	100 ,,
Lavender oil—terpeneless	50 ,,
Ambrette R.	50 ,,
Geranium R.	50 ,,
Styrax R.	50 ,,

In all cases the ottos should be diluted with alcohol or other suitable solvents before being sprayed on, as this ensures more even distribution of the perfume. The crystals, after evaporation of the perfume solvent, are ready and should be bottled *without delay*.

Bath Tablets are made by heavy machine compression of any of the above-mentioned crystals. After tinting they should be allowed to dry until a slight effloresence becomes evident, when the perfume (containing up to 25 per cent of R.) should be sprayed on. It is advisable to mix the otto with some 50 per cent alcohol, as the presence of small quantities of water helps the effloresced portion of the crystals to act as a binding agent—this being assisted by the proportion of R. contained in the perfume. Bath tablets made in this manner disintegrate readily in hot water, but if more rapid solution is desired in cold water, traces of starch should be added before compression. This is more useful than an acid such as tartaric, as its employment makes the punches and dies sticky, which always retards efficient production.

Bath Powders are generally made with either dried sodium carbonate or sesquicarbonate and sometimes borax. The sesquicarbonate occurs in small crystals which do not readily give up their water. These products are generally highly perfumed, and for this purpose mixtures of essential oils and synthetics with fixators are used. The packing should be dainty and small transparent tubes of cellophane look quite attractive. Sufficient powder should be enclosed in each one for a bath. The method of manufacture is simple with a sifting and mixing machine as described elsewhere in this work. When this apparatus is used the

perfumes are sprayed on, but if desired they may be rubbed down with some of the powder and sifted before adding to the bulk. When a dye is used to colour the preparation, it is dissolved in sufficient water and incorporated with some of the powder, and then sifted and mixed with the bulk. Some formulæ are appended :—

A.

Sodium sesquicarbonate	800 grams
Borax (powdered)	200 ,,
Ionone beta	2 c.c.
Methyl heptine carbonate	0·1 ,,
Ylang-ylang oil—Bourbon	1 ,,
Orris resin	1 ,,
Bergamot oil	3 ,,
Chlorazol green G.	0·1 gram

B.

Dried sodium carbonate	1000 grams
Benzyl acetate	4 c.c.
Indol	0·1 gram
Methyl anthranilate	1 ,,
Methyl naphthyl ketone	1 ,,
Chrysophenine G.	0·1 ,,

C.

Borax	1000 grams
Geraniol from palmarosa oil	5 c.c.
Iso-butyl phenylethylate	1 ,,
Phenylethyl alcohol	2 ,,
Benzo purpurine 4 B.	0·1 gram

Bath Fluids are made with glycerine, ammonia, perfume, and a suitable dyestuff. The following formula for **Pine Bath Fluid** will indicate their general composition :—

Glycerine	850 c.c.
Strong solution of ammonia ·880	50 ,,
Alcohol	30 ,,
Bornyl acetate	50 ,,
Terebene	10 ,,
Rose geranium oil	5 ,,
Basic green	5 grams

Rub down the dye to a smooth powder and add the glycerine. Dissolve the perfumes in the alcohol and incorporate ; then add the ammonia.

A small quantity added to a bath is sufficient to perfume and tint the water effectively.

Bath Pot-pourri is a novelty and is made by mixing any good pot-pourri with an equal quantity of borax crystals. The whole is placed in dainty silk bags with ribbon attached so that they can be suspended from the hot water tap of the bath. When the water is turned on, the bath and the whole atmosphere of the room becomes permeated with the fragrance of the compound, which can be repeatedly used before becoming exhausted. The presence of vetivert roots and patchouli leaves is desirable as they help the pot-pourri to retain its perfume for a much longer period. The solids should be reduced to a coarse powder and the liquids evenly distributed over the whole mixture. Formulæ follow :—

A.

Borax crystals—small	500 grams
Benzoin	50 ,,
Geranium herb	50 ,,
Orris root	100 ,,
Sandalwood—rasped	50 ,,
Patchouli leaves	50 ,,
Vetivert roots	100 ,,
Rose leaves	100 ,,

B.

Borax crystals—small	500 grams
Lavender flowers	100 ,,
Rose petals	150 ,,
Cinnamon	25 ,,
Cloves	25 ,,
Musk extract soluble 10 per cent	10 c.c.
Vanilla	50 grams
Vetivert oil	50 c.c.
Fixol	50 ,,
Amber liquid	40 ,,

C.

Rose petals	300 grams
Rose geranium oil	50 c.c.
Patchouli leaves	50 grams
Civet extract soluble 10 per cent	10 c.c.
Rosindol	20 grams
Iso-butyl phenylacetate	20 c.c.
Orris root powder	50 grams
Borax crystals—small	500 „

Water Softeners are similar to bath powders, but rarely fetch the same price. The base generally consists of *dried* sodium carbonate, to which may be added either slaked lime or ammonium carbonate. These products are seldom tinted. Formulæ follow :—

A.

Sodium carbonate dried	1000 grams
Heliotropin	3 „
Musk xylol	2 „

B.

Sodium carbonate dried	800 grams
Slaked lime—in powder	200 „
Rosemary oil	2 c.c.
Spike lavender oil	3 „

C.

Sodium carbonate dried	950 grams
Ammonium carbonate—powdered	50 „
Coumarin	3 „
Bergamot oil	1 c.c.
Petitgrain oil—Paraguay	1 „

These products are made *as described* under *Bath Powders* (*which see*).

Another type of water softener is **Household Ammonia,** and this product is put to a variety of uses. It acts like a charm on the hardest water, softens it, renders it pleasant to the touch and almost dispenses with the necessity for soap. It is useful for laundry purposes, cleaning plate, and removing grease and dirt from clothing. There are two

varieties, *cloudy* and *clear*. The first owes its peculiarity to the presence of a *stearate*, which should exist in minute traces only for really good products—an excess renders the preparation unsightly. This type is not very frothy, but the clear variety, being made with an *oleate*, produces a very foamy article, and while its appearance is not so elegant, it is if anything more pleasant to use. The quantity of ammonia, calculated as NH_3, is generally about 10 per cent, but can be varied to suit the purpose for which the product is intended—for laundry use the proportion may be increased. The perfume is generally obtained with the essential oils of lavender, rosemary, geranium, pine, or bergamot, and the addition of small quantities of an alkaline carbonate is desirable. Formulæ are appended illustrating both types :—

Cloudy.

Stearic acid—pressed . . .	0·1 grams
Potassium carbonate . . .	5 „
Strong liquid ammonia ·880 . .	400 c.c.
Rosemary oil	0·2 „
Bergamot oil	0·2 „
Distilled water—to produce . .	1000 „

Dissolve the K_2CO_3 in boiling distilled water (200) and add the fatty acid in lumps. Heat until completely saponified and then dilute to 600 with water. Add the perfume and then the ammonia. The cloud will develop in a few hours.

Clear.

Oleic acid—purified . . .	5 c.c.
Industrial spirit	5 „
Potassium carbonate . . .	7 grams
Strong liquid ammonia ·880 . .	450 c.c.
Pine oil	2 „
Rose geranium oil—Bourbon .	1 „
Distilled water—to produce . .	1000 „

Dissolve the pot. carb. in warm water (200) and add the mixed acid and spirit. Shake until saponified, then proceed as above.

Note.—If a large quantity of oleic acid is used a cloud will develop after twenty-four hours. This is accounted for by the stearates contained in all commercial samples—*absolutely pure* oleic acid being practically unobtainable.

CHAPTER II.

DENTAL PREPARATIONS.

1. The teeth.
2. Tooth powders, bases, colours, flavours, methods of manufacture.
3. Acid dentifrices, alkaline, antacid, antiseptic, camphorated chalk, carbolic, charcoal, oxygenated, quinine, smokers, saponaceous, tin oxide, and tartar remover.
4. Tooth pastes, excipients, soaps, colours, bases, consistency.
5. Manufacture, filling, simple machine, formulæ.
6. Solid dentifrices.
7. Liquid dentifrices, foaming, saponaceous, non-frothy.
8. Mouth washes, glycerine thymol, myrrh and borax.

The Teeth.—It is generally acknowledged that the condition of the teeth plays an important part in determining the health of the human being. It is also conceded that the examination of the mouth periodically by a dentist is necessary, and should commence in early childhood. The most important factor, however, and one which is sometimes neglected, is the daily cleaning of the teeth by the use of a dental application in the form of powder, paste, or fluid.

There are thirty-two permanent teeth, each jaw containing—

six molars,
four bicuspids,
two canines, and
four incisors.

Each tooth is made of a bony substance called *dentine*.

It is covered by a modified skin, which has been so impregnated with calcium salt as to form a protective shell of extreme hardness called *enamel*.

Inside is the *pulp cavity*, which contains numerous nerves and blood vessels. This is the most sensitive part of the tooth.

The fangs or roots of the tooth are covered with a bone-like substance called *cementum* and are embedded in the jaw.

The part of the tooth above the gum is the *crown*, and the enamel is most dense at the cutting edges.

The junction of the roots and crown is called the *neck*.

The dentist has to deal with many disorders, and the most difficult of these is probably **Pyorrhœa alveolaris**, as the patient suffering from it will in one day swallow a large quantity of pus.

The first indication of pyorrhœa is the partial detachment of the margin of the gum, which gradually thickens. If the finger is gently pressed on this, some pus or blood-stained liquid will exude from the intervening space. If the disease is not checked the gum will gradually become detached from the tooth and may even spread as low as the socket. The infection appears to be of bacteriological origin, and among the treatments recommended by eminent authorities for its relief are :—

Painting the margin of the gums with cocaine.

Careful removal of all tartar.

Syringing of the pouches with copper sulphate solution, with or without phenol.

Brushing the teeth with a soft brush and an antiseptic mouth-wash several times a day.

Tooth Powders are made in great variety, but the list of basic substances from which they are compounded is a relatively small one. The most important bodies are :—

Precipitated chalk—light and heavy (crystalline).
Prepared chalk (amorphous).
Calcium phosphate.
Orris root powder.
Kieselguhr.
Kaolin.
Magnesium carbonate—heavy.
Cuttlefish bone.
Pumice.
Bicarbonate of soda.
Borax.
Cream of tartar.

Light precipitated chalk is by far the most popular base, not only on account of its cheapness and bulkiness, but more particularly owing to the fact that the faces of the crystals remove any foreign matter adhering to the enamel without damaging it.

Kieselguhr and kaolin are generally employed in coloured tooth powders.

Pumice and cuttlefish bone should never be used in large proportions in any dentifrice as their gritty nature is apt to injure the enamel. Dentists only recommend these two substances for the removal of an undue amount of tartar, and they seldom advise their *daily* use.

Cream of tartar is rarely used and then only in *acid* dentifrices.

Tooth powders are generally sent out *white*, but of the coloured kinds *pink* is the most popular. This colour is generally obtained with a dyestuff—phloxine or erythrosine for example, which is previously dissolved in water. These dyestuffs are much easier to manipulate than carmine, which requires an unusual amount of trituration, and furthermore they produce tints which are much more pleasing to the eye. *Blue* tooth powders are occasionally met with, the object of the particular colour being presumably to whiten teeth which have become unusually yellow. Such tints are obtained with methylene blue, victoria blue, etc. When the manufacturer has this purpose in view it is better to use a *peroxide*, such as calcium or magnesium, and avoid the tinting of the product. *Perborates* are also employed for this purpose. In order to assist the basic substance in cleaning the teeth, *soap* is often used. The choice of a good and *tasteless* material is most desirable, since the objectionable after-flavour of a bad soap is detrimental to repeat sales.

The most popular dentifrice *flavouring agent* is in Europe—peppermint; in America—wintergreen. Neither of these liquids are used alone, but are blended with other oils such as cinnamon, nutmeg, cloves, eucalyptus, pimento, thyme, lavender, rose, etc. It is always advisable to allow the oils to mature together for a month or so before use.

The *method of manufacture* of tooth powders is simple, but the necessity for mechanical mixing and sifting is essential in all large-scale production. The oils are incorporated with a part of the base which is resifted twice through a sixty-mesh tinned steel wire sieve. This ensures perfect subdivision and distribution of the active constituents, and if the preparation is to be tinted, the colours should be added in solution at this stage. The whole is then added to the bulk and resifted and mixed twice. Sixty-mesh constitutes the desired standard of fineness.

Acid Dentifrices may have as their base either kieselguhr or milk sugar, but cream of tartar is the active constituent. They are usually tinted :—

1.

Cream of tartar	400 grams
Kieselguhr	600 „
Erythrosine	0·5 „
Oil of peppermint	10 c.c.
Citral	1·5 „

2.

Potassium bitartrate	300 grams
Milk sugar	300 „
Kieselguhr	400 „
Acid scarlet, 2 R.	0·2 „
Clove oil	7 c.c.
Caraway oil	2·8 „

Alkaline Tooth Powder.

3.

Sodium bicarbonate	50 grams
Borax	50 „
Magnesium Carbonate—heavy	400 „
Precipitated chalk—light	500 „
Eucalyptol	5 c.c.
Terpenyl acetate	5 „
Soluble saccharine	1 gram

Antacid Dentifrices.

4.

Precipitated chalk	700 grams
Magnesium carbonate—heavy	225 „
Borax	75 „
Eosine	1 „
Cassia oil	8 c.c.
Rose oil	2 „

5 (with soap).

Sodium bicarbonate	40 grams
Powdered white castile soap	60 „
Precipitated chalk—heavy	900 „
Oil of peppermint	15 c.c.
Clove oil	5 „
Cinnamon oil	1 „

6 (very frothy).

Powdered soap	150 grams
Precipitated chalk—light	810 „
Sodium bicarbonate	30 „
Sodium chloride	10 „
Thyme oil	2 c.c.
Peppermint oil—Italo-Mitcham	18 „
Nutmeg oil	3 „
Eugenol	2 „
Saccharine 500	2 grams

Antiseptic Dentifrices are very similar to the above, with the addition of such substances as salol, phenol, boric acid, chlorate of potash, etc. :—

7.

Salol	25 grams
Powdered hard soap	100 „
Boric acid	25 „
Magnesium carbonate—heavy	100 „
Prepared chalk	150 „
Precipitated chalk	600 „
Eucalyptol	15 c.c.
Anethol	5 „
Phenylethyl alcohol	10 „

FIG. 60.—Type of machine used in the Manufacture of Tooth Powders, etc.

The various ingredients are placed in the hopper at top (with regulatable feed), which conducts them on to a specially formed circular brush, mounted in a semi-circular sieve frame.

This is covered with the mesh desired for the preparation to be treated and is so designed that foreign matter contained in the powders is automatically ejected through the overtail chute at the end of the sieve.

The sifted powders fall direct into the agitating chamber where they are evenly mixed.

The flavours may, if desired, be sprayed on to the powders by the apparatus situated on the left. This is disengaged when a flavourless powder such as Camphorated Chalk is being prepared.

The powders are discharged while the machine is working, through an outlet at the bottom.

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8.

Potassium chlorate	50 grams
Powder d myrrh	50 „
Phenol liquid	25 „
Powdered orris root	75 „
Powdered soap	100 „
Kieselguhr	200 „
Heavy precipitated chalk	500 „
Caraway oil	5 c.c.
Clove oil	5 „
Peppermint oil	10 „

Add the carbolic acid to the kieselguhr and orris first, colour if desired, and then add the other ingredients.

Camphorated Chalk was at one time in great demand, but this has shown a distinct tendency to fall off in late years. The reason may be the pronouncement of one authority, who holds that while camphor whitens the teeth, it does so at the expense of cracking the enamel. In the majority of cases the following formula is adopted :—

9.

Camphor	100 grams
Precipitated chalk	900 „
Alcohol	a sufficient quantity.

The camphor is reduced to a fine powder by triturating it in a mortar with the spirit. The chalk is then added gradually, and the whole sifted twice—a sixty-mesh sieve is the desired standard of fineness.

In some cases magnesium carbonate, orris, or kieselguhr is added to the chalk as follows :—

10.

Camphor	150 grams
Kieselguhr—*white*	50 „
Orris root powder	100 „
Precipitated chalk	700 „
Rectified spirit	q.s.

Proceed as above.

The camphor content may be as low as 5 per cent, and as high as 20 per cent.

Carbolic Tooth Powders are made with either crystalline or liquefied carbolic acid. The latter is prepared by taking 100 grams of absolute phenol, adding 15 c.c. of distilled water, warming the two together in a water-bath, and then making the final weight 115 grams, by the addition of more water if necessary. The product should not solidify under normal conditions. The crystalline substance may also be liquefied by trituration with the flavouring oils or camphor, if it is included in the formula. Tooth powders containing fairly high percentages of phenol are liable to show signs of crystallisation after being made some time, and especially when they have been stored in too warm an atmosphere. This peculiar condition is more noticeable when the *liquefied* acid has been employed, but is prevented if rubbed down with the oils and kieselguhr or orris before adding the chalk. Carbolic tooth powders are generally coloured pink, and a useful dyestuff for the purpose is phloxine. It is either dissolved in water and added to the base or else, as is more frequently the case, mixed with the phenol and oils. Prolonged trituration in a mortar or mill of the essentials with part of the base is desirable ; this is then added to the remainder, sifted, and mixed twice in a machine.

The most useful bases are kaolin, *heavy* precipitated chalk, and kieselguhr.

The most popular flavours are clove, rose, and wintergreen—peppermint is not often used.

Here are some formulæ :—

11.

Phenol absolute	25 grams
Kieselguhr	575 „
Heavy precipitated chalk	400 „
Rose otto	2 c.c.
Eugenol	8 „
Phloxine or magenta crystals	2 grams

12.

Liquefied carbolic acid	40 grams
Camphor	10 „

12 *continued.*

Kaolin	700 grams
Orris root powder	150 „
Soap powder	100 „
Bergamot oil	5 c.c.
Rose geranium oil	5 „
Neroli oil	3 „
Clove oil	7 „
Erythrosine, 3 B.	5 grams

Note.—Either of these products may be sweetened if desired by the addition of suitable quantities of *soluble* saccharin, *i.e.* 1 to 2 grams in a kilo.

Charcoal Dentifrices are made with finely levigated *Carbo ligni*—as follows :—

13.

Powdered charcoal	400 grams
Powdered cuttlefish bone	100 „
Prepared chalk	200 „
Heavy magnesium carbonate	200 „
Sugar of milk	100 „
Benzaldehyde F.F.C.	0·5 c.c.
Eugenol	6 „
Citronellol	3·5 „

14.

Finest charcoal powder	800 grams
Myrrh powder	175 „
Quinine sulphate	25 „
Menthol	0·75 „
Rose-geranium oil	8 c.c.
Clove oil	5 „
Nutmeg oil	5 „

15.

Camphor	45 grams
Charcoal	350 „
Menthol	5 „
Heavy precipitated chalk	600 „
Cassia oil	5 c.c.
Cinnamon oil	5 „

Oxygenated Tooth Powders are made with either calcium or magnesium peroxides, and sometimes with sodium perborate :—

16.

Calcium peroxide	10	grams
Kieselguhr	340	„
Precipitated chalk—light	600	„
Hard soap in powder	50	„
Menthol	0·5	„
Methyl salicylate	4·5	c.c.
Peppermint oil—Italo-Mitcham	5	„

17.

Sodium perborate	25	grams
Castile soap powder	75	„
Prepared chalk	300	„
Precipitated chalk—light	600	„
Thymol	0·1	„
Eucalyptol	5	c.c.
Geraniol	14	„
Saccharin ·500	0·7	gram

Quinine Dentifrices may contain either quinine sulphate or powdered cinchona bark and sometimes both. They are often prescribed by medical men for those who are under treatment with mercury, in some form or another, and are said to prevent the loosening of the teeth. Chlorate of potash, myrrh, rhatany, and orris are also common constituents of this type of tooth powder. *Peruvian* is a pseudonym frequently adopted for these products. Here are two formulæ :—

18.

Quinine sulphate	5	grams
Powdered pumice	45	„
Precipitated chalk—heavy	900	„
Castile soap powder	50	„
Cassia oil	5	c.c.
Rose geranium oil	5	„

19.

Cinchona powder	20	grams
Krameria „	50	„
Myrrh „	26	„
Quinine sulphate	4	„
Potassium chlorate	100	„
Chalk	800	„
Peppermint oil—American	5	c.c.
Geranium oil—Bourbon	3	„
Lavender oil—French	2	„

Smoker's Tooth Powders usually contain a fair proportion of gritty substances such as pumice or cuttlefish bone. They are generally heavily perfumed and occasionally tinted *blue*. Two formulæ follow :—

20.

Cuttlefish bone powdered	200	grams
Kieselguhr	700	,,
Powdered soap	100	,,
Menthol	0·6	,,
Thyme oil	1	c.c.
Clove oil	9	,,
Nutmeg oil	4·4	,,
Methylene blue	·2	grams

21.

Powdered pumice	100	grams
Powdered orris	100	,,
Kaolin	200	,,
Heavy chalk	600	,,
Saccharine soluble	2	,,
Chlorazol blue 3 B.	1	,,
Peppermint oil—Italo-Mitcham	5	c.c.
Lavender oil—French	5	,,
Geranium oil—Grasse	9	,,
Nutmeg oil	1	,,

Saponaceous Tooth Powders when so named generally contain a large quantity of soap, and as much as 30 per cent is used by one well-known manufacturer. Lemon is a favourite flavour and well covers the slight taste of the soap :—

22.

Powdered Castile soap	200	grams
Chalk—precipitated, heavy	400	,,
Carbonate of magnesia	400	,,
Gluside 500	1	,,
Peppermint oil	1	c.c.
Lemon oil	9	,,

23.

Powdered soap	150	grams
Kieselguhr	350	,,
Chalk—precipitated, light	500	,,
Lavender oil—French	5	c.c.
Rose geranium oil	5	,,

24.

Powdered soap (from cocoa butter)	180	grams
Powdered borax	20	,,
Prepared chalk	200	,,
Precipitated chalk	600	,,
Saccharine	1·5	,,
Eucalyptus oil	6	c.c.
Methyl salicylate	4	,,
Rose otto	1	,,

Tin Oxide Dentifrices possess the peculiar property of giving an unusual gloss to the teeth. The quantity of stannic oxide used should not exceed 10 per cent, and in some cases a little pumice or cuttlefish bone is added. Two formulæ are appended :—

25 (pink).

Kieselguhr	800	grams
Stannic oxide	100	,,
Phenol	10	,,
White Castile soap	90	,,
Bergamot oil	10	c.c.
Clove oil	5	,,
Rose geranium oil	5	,,
Eosine	1	,,

26 (white).

Precipitated chalk—light	800	grams
Powdered pumice	25	,,
Stannic oxide	75	,,
Powdered soap	100	,,
Saccharine soluble	1	,,
Peppermint oil—Italo-Mitcham	5	c.c.
Thymol	0·1	gram
Cassia oil	2	c.c.

Tartar Remover Tooth Powders are said to be most efficacious when they do *not* contain a carbonate, soap, or any alkaline constituent. The active ingredient should be *sodium benzoate* since it acts as a solvent on the tartar incrustations. Here is a suitable formula :—

27.

Sodium benzoate	50	grams
Kieselguhr	950	„
Erythrosine 3 B.	1	„
Gluside 500	1·5	„
Cassia oil	4	c.c.
Clove oil	8	„
Peppermint oil—Italo-Mitcham	8	„

Tooth Pastes may be prepared from almost any of the above-mentioned powders, but satisfactory products will only be obtainable if a suitable *excipient* is used in each case. A selection may be made from the following :—

Glycerine.
Glycerine of starch.
Honey (clarified).
Simple syrup.
Golden syrup (purified molasses).

These substances are seldom, if ever, used alone but are more generally diluted with three or four times their weight of water.

Dental creams have a tendency to *harden*, and this is particularly noticeable when they contain an appreciable quantity of *soap*. Three kinds may be used, and the above characteristics are most marked when powdered Castile soap is employed. The cream is then made on the soft side, and in some cases it is better to even make it *liquid*. The soap gradually dissolves in the excipient and stiffens after a few hours, when a good indication of the consistency of the paste is obtained. It is always desirable to add 1 *per cent of liquid paraffin* (which must be of high viscosity and have a specific gravity of at least 0·885), since this small quantity of mineral oil will act as a lubricant, and even if the cream stiffens noticeably, it will come out of the tube without undue pressure.

Another good soap is made from cocoa butter by saponifying it with soda lye, the resulting product being washed, salted out, etc., in the usual manner. It possesses no appreciable taste, and this is easily masked with the

ordinary flavouring agents, of which peppermint and eucalyptus are good examples.

Soft soap is occasionally employed, and is made by saponifying olive or almond oil with potash lye. In order to prevent any reaction after the cream is made, the soap must be absolutely neutral.

The *colour* of a tooth paste depends largely upon the choice of bases. For *white* kinds chalk is good, but in many cases it has recently been replaced, either wholly or in part, by **Tricalcium Orthophosphate**, purified and in fine powder. Kieselguhr, kaolin, orris, etc., cannot be used owing to the yellowish-grey colour produced when mixed with the excipient. They are, however, excellent bases for *pink* creams. Borax should be avoided, as there is a tendency to form boric acid in the presence of glycerine. If the base contains chalk, free CO_2 may be liberated, when the paste will become spongy. Salicylic acid is a good preservative; one in a thousand is sufficient, but great care is necessary during manufacture, otherwise a brownish cream will result (on contact with iron). The *consistency* of the cream is improved by the presence of some mucilaginous substance. Starch and tragacanth are good, but acacia is not used as it ferments very rapidly. One and a half to two grams of tragacanth per kilo of cream is ample.

Manufacture.—This is a little more difficult than the production of tooth powders, and the inside of the machine and blades should be at least *tinned*, but for preference *enamelled*. The best type of modern machine is of similar construction to that illustrated on p. 336, but there are other patterns. Dough mixers make very good pastes, but the movement of the blades should be slow. If rotation is too rapid the paste will contain a lot of air bubbles, which is a decided disadvantage, and will cause trouble while the cream is being filled into tubes.

The excipient is first mixed with the desired quantity of water, and some of it is placed in the machine. The powder bases, which have been previously sifted, are now added gradually, the right balance or consistency being maintained

by the frequent addition of further quantities of excipient. The flavouring agents are added during this part of the process, as also the mucilaginous bodies, if contained in the formula. The soap is added *last*, when the cream will immediately become very soft. Mixation is continued until even distribution of all the constituents has been attained, and the product is then put through a fine sieve to remove any grit or lumps of congealed soap, etc. The cream is allowed to stand a few hours and then filled.

Filling into tubes is an operation which requires much attention on the part of the manufacturer, as if the methods are not efficient much money may be lost. There are several machines obtainable, and the usual pattern for small production is worked by hand, and consists of a hopper for the cream, a forcer manipulated with the right hand, and a cut-off operated either by the left hand, or preferably by the foot, when the left hand is free to place the tubes on the ejecter. For large-scale production there are machines which do everything but pack the closed tubes in boxes. Some of these are satisfactory, but they are generally very expensive and require much careful attention. A very simple filling apparatus can be made from a *mincing machine* if the diagram overleaf be followed in detail.

A is the hopper, which may be connected with the floor above if the mixing plant is situated there, and this arrangement saves much time and money, as gravity does the work required of men when the mixing plant is on the same floor as the filling apparatus. B is the body of the mincing machine, which is not used satisfactorily as purchased. It is imperative that the worm C should fit *exactly*, and this can only be attained by tinning the inside of the mincer and then re-turning to the exact bore. The base D is clamped firmly to the table E. The pulley F is driven from a shaft above, and each machine requires a motor of about two horse-power for efficient work. The part G requires to be made so that it will screw on to the end of the mincing machine. The cream is forced through this into H, which

has *one or two* exit tubes, J, on each side. The operator places the dental cream tube on J, and by pressing down the cord K with a foot appliance, forces the cut-off plate L into the box M, and the cream passes into the tube through J.

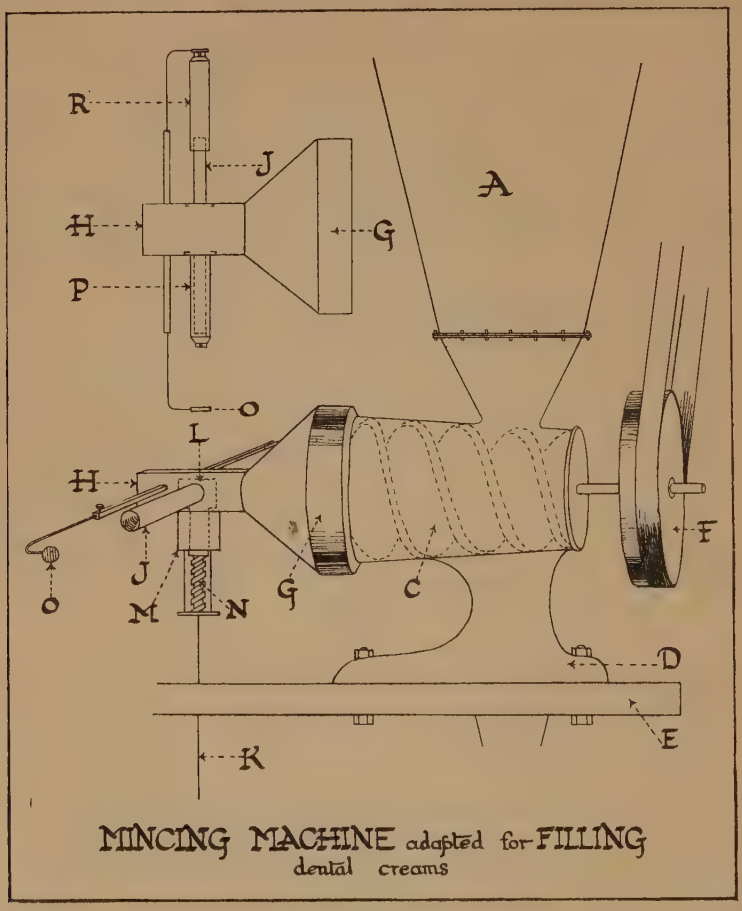


FIG. 61.

When the foot is released the plate L is forced back by the spring N, and the tube may be removed from J and replaced by another one. The operation is repeated "ad lib." The stopper O may be adjusted according to the length of

the cream tube and the quantity of paste desired to fill it. Its use is not imperative since a mark can be filed on J, and the operator will release the spring when the tube passes it. P shows the position of the tube when first placed on the nozzle J, while R shows its position (on the opposite side) when filled.

The filled tubes are now passed on to *operator No.* 2, who nips them to the desired shape, using a small device fitted to the table ; and then to *No.* 3, who makes a double bend in the flat end of the tube with a neat little machine ; and then to *No.* 4, who places a clip in the sealed end ; *No.* 5 cleans off any adherent cream ; *No.* 6 cartons the tube ; and *No.* 7 packs these in boxes ready for dispatch !

Formulæ.

White Cream.

Precipitated chalk—light	500	grams
Tricalcium orthophosphate	400	,,
Soluble saccharine	0·5	,,
Castile soap powder	100	,,
Tragacanth	1	,,
Peppermint oil	5	,,
Spearmint oil	1	,,
Methyl salicylate	2	,,
Clarified honey, Glycerine, Water	of each, a sufficient quantity	

Pink Cream.

Kieselguhr	400	grams
Heavy chalk	300	,,
Powdered orris	100	,,
Salicylic acid	1	,,
Powdered soap	200	,,
Eucalyptol	9	c.c.
Menthol	0·5	gram
Eugenol	6	c.c.
Gluside ·500	0·75	gram
Erythrosine 3 B.	1	,,
Glycerine of starch	—	
Water	aa q.s.	

Solid Dentifrices are a convenient and handy form of cleansing specific for the teeth. They are made by dissolving soap, preferably that made with soda lye, in a mixture of glycerine and water with the aid of heat. Any tooth powder may then be incorporated until the whole is a stiff mass. This is dried on trays, and when no more shrinkage occurs, it is cut into blocks, which are stamped out with a machine. The percentage of flavour is always higher in these products owing to the quantity of soap present. It should not be less than 2 per cent.

Liquid Dentifrices and **Mouth Washes** have a comparatively small sale in Britain, and the latter are often prescribed by medical men and dentists for improving the condition of the mouth and in some cases for hardening the gums. The qualities that must be possessed by them all are :—

1. A refreshing and pleasing flavour.
2. A delicate odour.

A further division is made between those which are foaming, or saponaceous, and those which are not.

The *refreshing flavour* is obtained in nearly all cases with either menthol or oil of peppermint, although oil of spearmint is sometimes used. When oil of peppermint is employed the finest quality only must be used, and if the product will not stand the high price of English oil, then use **Italo-Mitcham**. Other flavouring agents used in conjunction with mint are : anethol, eugenol, eucalyptol, cinnamon, cassia, rose, pelargonium, caraway, lavender, and wintergreen.

Cinnamon, cassia, and cloves are used in very small quantities owing to the intensity of their flavour, but as the others are pleasanter, larger proportions may be employed. Cologne oils are also useful in certain types.

Foaming properties are obtained with the use of quillaia bark, or for preference **Saponin**. If the former is employed it should be reduced to no. 10 powder, and either macerated or percolated (preferably the latter) with 30 per cent alcohol.

If a colourless product is desired the tincture so obtained must be filtered through charcoal. Saponin is apt to produce a straw-coloured solution, and in consequence a similar procedure is desirable.

Saponaceous dentifrices are made with either theobroma, olive, or almond oil soaps (described under dental creams, *which see*).

The *antiseptics* employed include: salol, boric and benzoic acids, borax, phenol, and thymol.

The *colours* used include: carmine or cochineal, eosine, magenta, and saffron.

When a few drops of the product are to be added to a wineglass of water, the strength of alcohol used is fairly high. Terpeneless oils are best for "de luxe" preparations, and when milkiness is required it is obtained by the use of myrrh, benzoin, or salol. The resinous matter in the two former throw out when added to water. Sometimes liquid dentifrices are directed to be applied to the brush when these need not be used.

Foaming Dentifrices.

A. (Colourless).

Peppermint oil—*Italo-Mitcham*	10	c.c.
Thymol	0·2	gram
Anethol	4	c.c.
Eugenol	1·8	,,
Cinnamon oil	0·5	,,
Saponin	0·5	gram
Benzoin R.	2·5	c.c.
Orange flower water—triple	75	,,
Alcohol 90 per cent—to produce	1000	,,

B. (Pink).

Peppermint oil—English	5	c.c.
Anise oil (from Pimpinella A.)	5	,,
Phenol	20	grams
Boric acid	20	,,
Tincture of myrrh	20	c.c.
Tincture of quillaia	100	,,
Tincture of cochineal	50	,,

B. (Pink) *continued.*

Tincture of vanilla	30	c.c.
Cinnamon oil	1	,,
Clove oil	2	,,
Glycerine	50	,,
Rose water—triple	100	,,
Alcohol—to produce	1000	,,

Saponaceous Dentifrices.

C. (Red).

Cocoa butter soap	50	grams
Methyl salicylate	2	c.c.
Clove oil	1·5	,,
Peppermint oil	8	,,
Aniseed oil	3	,,
Rose-geranium oil	1	,,
Menthol	0·5	gram
Rhatany tincture	30	c.c.
Myrrh tincture	20	,,
Salol	10	grams
Cinnamon water	100	c.c.
Alcohol 90 per cent—to produce	1000	,,

D. (Pink).

Olive oil soap	100	grams
Glycerine	100	,,
English oil of peppermint	10	c.c.
Oil of cassia	0·5	,,
Oil of cloves	1	,,
Oil of eucalyptus	2·5	,,
Vanillin	0·75	gram
Oil of aniseed (star)	3	c.c.
Eosine or phloxine	0·1	gram
Alcohol 80 per cent—to produce	1000	c.c.

Non-frothy Dentifrices.

E. (similar to Odol).

Salol	40	grams
Peppermint oil—finest	7·5	c.c.
Gluside ·500	2	grams
Anethol	0·5	c.c.
Essence of vanilla	5	,,
Alcohol 90 per cent—to produce	1000	,,

F. (similar to Pierre).

Star anise	100	grams
Cochineal	10	,,
Spirits of wine 90 per cent	900	c.c.

Macerate for fourteen days, press the marc and filter. Then add:—

Anise oil	30	c.c.
Peppermint oil—Mitcham	10	,,
Heliotropin	0·5	gram
Alcohol 90 per cent—to produce	1000	c.c.

Store in the cold for six months and then filter bright.

G. (similar to Eau de Botot).

Anethol	10	c.c.
Eugenol	1	,,
Cinnamon oil	0·5	,,
Lemon oil	0·5	,,
Peppermint oil—English	3	,,
Tincture of cochineal	5	,,
Alcohol 90 per cent	750	,,
Triple rose water—to produce	1000	,,

Dissolve the aromatics in the alcohol and then add the rose water of commerce.

H. (Sodium Phenate).

Phenol	20	grams
Sodium hydroxide sticks	5	,,
Glycerine	150	c.c.
Tincture of cudbear	50	,,
Orange flower water—triple	250	,,
Rose water—triple	150	,,
Cinnamon water	50	,,
Peppermint water—to produce	1000	,,

Dissolve the phenol and caustic soda in the orange flower water and add the other ingredients.

Note.—According to the chemical equation the carbolic acid is in excess—but this is the usual way of preparing the article.

Mouth Washes are used frequently when the mouth is sore or tender. The average quantity for each application is two teaspoonfuls to a wineglass of water.

K.

Boric acid crystals	20	grams
Tincture of myrrh	250	c.c.
Tincture of krameria	30	„
Menthol	1	gram
Orange flower water	100	c.c.
Eau de Cologne—to produce	1000	„

Filter bright—if necessary—using talc.

L.

Menthol	0·5	gram
Thymol	0·1	„
Anise oil	2	c.c.
Eucalyptus oil	1	„
Peppermint oil—*Italo-Mitcham*	5	„
Eugenol	1	„
Benzoic acid	20	grams
Tincture of myrrh	100	c.c.
Alcohol—to produce	1000	„

M. (Glycerine Thymol).

Menthol	0·5	gram
Thymol	0·2	„
Eucylyptol	1·3	c.c.
Bornyl acetate (or oil of pine)	0·5	„
Methyl salicylate	0·3	„
Anethol	0·2	„
Tinct. cochineal	5	„
Alcohol	50	„

Mix these together and add to the following solution—

Borax	20	grams
Sodium bicarbonate	10	„
Sodium benzoate	5	„
Sodium salicylate	5	„
Glycerine	100	c.c.
Water—to produce	950	„

The product now makes one litre.

Stand aside for twenty-four hours, stirring occasionally, and then filter, using either talc or kaolin if necessary, to obtain a perfectly bright product.

Myrrh and Borax with Cologne.

Tincture of myrrh	300	c.c.
Tincture of rhatany	20	,,
Neroli oil	1	,,
Lemon oil	2	,,
Bergamot oil	2	,,
Rosemary oil	0·5	,,
Clary sage oil	0·5	,,
Sweet orange oil	1	,,
Glycerine of borax	100	,,
Alcohol 90 per cent—to produce	1000	,,

Mix and make up to volume. For use as a mouth wash dilute one teaspoonful to a wineglassful of water.

CHAPTER III.

HAIR PREPARATIONS.

1. Bay rums.
2. Brilliantines, one and two solution, solid.
3. Lime creams, crystallised and liquid.
4. Non-greasy creams.
5. Hair curling applications, powder and liquid.
6. Depilatories.
7. Hair fixers, solid and liquid.
8. Hair lotions and tonics, rosemary and cantharides, jaborandi, quinine.
9. Pomades, white and coloured.
10. Hair restorers.
11. Shampoos, powders, wet and dry, liquid, liquid dry.
12. Cocoa-nut oil shampoos, pine tar, and henna.

Bay Rum is said to have been first made in the West Indies. It is doubtful if any reaches Britain from this source nowadays, as practically every perfumer makes his own. The solvent for the bay oil rarely consists of rum, but is more frequently industrial methylated spirit diluted with water. In order to employ this raw material it is necessary to obtain a permit from the Customs authorities, and at the time of application the formula must be disclosed. *Quassia extract* must appear among the ingredients, and should occur to the extent of at least 0·05 per cent (dry extract). The bouquet of a good bay rum is suggestive of *Eugenol*, but this natural isolate is seldom used. The oils employed contain it, however, and may be chosen from—

Bay.
Pimento.
Clove.
Cinnamon leaf.

If the manufacturer desires to use *rectified* spirit and obtain a comparatively cheap product, he is recommended to replace any of the oils given in the following formulæ by their terpeneless equivalents (for these *see* table in Dictionary).

The colour of a bay rum should be the palest brownish-yellow, and this may be obtained by adding traces of burnt sugar (caramel) to the aqueous portion before mixing with the alcohol.

If rum is not used in the formula a suggestion of its presence may be obtained with acetic æther or by using mere traces of aldehyde C_7.

Here is an example made with Jamaica rum :—

A.

Oil of bay	2 c.c.
Oil of pimento	0·5 „
Alcohol	500 „
Jamaica rum	100 „
Water	400 „
Burnt sugar	q.s.

Another simple formula without rum :—

B.

Oil of bay	1·5 c.c.
Oil of cloves	0·5 „
Acetic æther	0·5 „
Alcohol	600 „
Tincture of quillaia	100 „
Water	300 „

Products having fine bouquets may be made as follows with industrial methylated spirit :—

C.

Oil of bay	2·5 c.c.
Oil of cinnamon *leaf*	0·4 „
Aldehyde C_7 (10 per cent solution)	0·1 „
Quassia extract solid	1 „
Industrial spirit	650 „
Water	350 „

D.

Oil of bay	1·5 c.c.
Oil of pimento	0·3 „
Eugenol	0·2 „
Æther acetic	0·5 „
Quassia extract	0·5 „
Industrial spirit	600 „
Water	400 „
Burnt sugar	q.s.

Dissolve the oils in the spirit and add the acetic æther. Tint the water with the colouring matter and dissolve the quassia extract in it, using gentle heat if necessary. Cool, and then mix the two solutions. Filter bright.

Brilliantines have a large sale. There are three distinct kinds: (1) liquid—*one*-solution, (2) liquid—*two*-solution, (3) solid.

The *liquid* kinds are generally made with liquid paraffin of gravity between ·870 and ·890. If a lighter oil is used it should be pure white, show no sign of fluorescence, be odourless, and as free as possible from sulphur compounds. Such oils are obtained at a cheap rate and have a gravity averaging ·860. Other liquids which may be employed are: castor, almond, olive, and pea-nut oils, and for *non-oily* types, glycerine alone or diluted with water.

The *perfumes* are compounded from synthetics and terpeneless oils. Ordinary oils and resinous fixatives should be avoided for perfuming *paraffin*, as they are not miscible in clear solution, and in consequence require filtering, which is slow and costly, apart from the loss of perfume.

The colours indicated for *pomades* may be used.

Here are some formulæ for **One-Solution Brilliantines:**—

Violet Oil (Green).

Liquid paraffin 0·870	800 c.c.
Almond oil	200 „
Chlorophyll	0·5 gram
Ionone beta	3 c.c.
Santalwood oil	1 „
Methyl heptine carbonate	0·1 „
Irone	1 „
Cananga oil—terpeneless	2 „

Rub down the chlorophyll in a warmed mortar with the fixed oil. Allow to settle, pour off bright, and add to the paraffin. Mix in the perfumes.

Lilac Oil (White).

Paraffin liquid 0·860	1000	c.c.
Hydroxy-citronellal	5	,,
Terpineol	5	,,
Benzyl acetate	2	,,
Musk ambrette	0·5	gram
Benzyl benzoate	2·5	c.c.

White Rose Oil.

Paraffin liquid	1000	c.c.
Rose otto synthetic	2·5	,,
Phenylethyl iso-butyrate	0·5	,,
Patchouli oil—terpeneless	0·1	,,

Oil of Flowers (Golden).

Paraffin liquid	500	c.c.	
Peach kernel oil	500	,,	
Benzoic acid	5	,,	
Methyl anthranilate	0·5	,,	(melted)
Hydroxy-citronellal	2·5	,,	
Bergamot oil—terpeneless	1	,,	
Terpineol	2	,,	
Rhodinol	2	,,	
Iso-eugenol	0·25	,,	
Oil soluble, yellow base	0·1	,,	

Mimosa (Alcoholic).

Castor oil	150	c.c.
Alcohol 90 per cent	850	,,
Malachite green	0·01	gram
Para-methyl acetophenone	1	c.c.
Terpineol	2	,,
Hydroxy-citronellal	0·5	,,
Benzyl acetate	0·5	,,
Peru balsam	6	,,

Carnation (Red).

Castor oil	800	c.c.
Almond oil	200	,,
Iso-eugenol	2	,,
Terpineol	1	,,

Two-Solution or *Separable* brilliantines are made by dissolving the perfume in strong alcohol, and then placing this in a bottle which is already about three-quarters full of the basic oils (coloured). Here is an example of

Verbena.

Verbena oil—Grasse	2 c.c.
Benzoin R.	0·5 „
Rose synthetic	1 „
Eugenol	0·2 „
Heliotropin	0·3 gram
Alcohol 90 per cent	250 c.c.
Dissolve and pour on to	
Paraffin liquid 0·890	700 „
Almond oil	50 „
Oil yellow (*saturated* solution in paraffin)	10 „

Here is another of

Essence Bouquet.

Neroli oil	1 c.c.
Bergamot oil	2 „
Lavender oil	0·5 „
Ylang-ylang oil	0·5 „
Rectified spirit	200 „
Liquid petrolatum 0·875	800 „

Solid Brilliantines consist largely of white or yellow paraffin jelly. The makers in fact sell this type of raw material of high melting-point, which only requires perfuming, and is then ready to be run into tins or pots. If the ordinary soft paraffin is used it should be mixed with ceresine or white wax. The two favourite colours are green and yellow, and these may be obtained either with chlorophyll or gamboge, or for preference with any of the oil soluble dyestuffs. The method of manufacture is identical with that of *Pomades* (*which see*).

Here are two formulæ :—

Oriental.

Soft paraffin—yellow	940 grams
Beeswax	60 „
Oil yellow—if necessary	q.s.
Patchouli oil	0·1 „
Vetivert oil	0.2 „
Ethyl cinnamate	0·1 „
Benzyl cinnamate	0·2 „
Bergamot oil	5 „
Rose synthetic	1 „
Balsam of Peru	4 „
Musk ketone	0·4 „

Violet.

Soft paraffin—white	900 grams
Ceresine—white (low melting-point)	100 „
Bergamot oil	3 „
Ionone alpha	2 „
Violet leaves absolute	0·1 „
Heliotropin	0·5 „
Violettophyx	0·4 „
Chlorophyll	q.s.

Lime Creams (Crystallised) are similar to the above. It is essential that all the ingredients should be devoid of colour in order that the cream when solid shall be pure white.

Here is a formula :—

Castor oil (*bleached*)	600 grams
Almond oil (*bleached*)	275 „
Cetaceum	100 „
Ceresine—white	25 „
Limetta oil—*terpeneless*	3 „
Bergamot oil „	2 „
Hydroxy-citronellal	1 gram

Melt and strain the bases—cool and add the perfume. Pour into tins or glass jars and allow to solidify slowly.

Lime Creams (Liquid) were invented by E. Rimmel, and at one time were a popular dressing for the hair. Many imitations have been put on the market, and the

majority of them are made from lime water and olive oil (with or without glycerine). Such preparations are not satisfactory and separate badly. Better imitations are made as follows :—

Almond oil	650 c.c.
Oil of limes—terpeneless	5 „
White soft soap	75 grams
Warm water	350 c.c.

Dissolve the soap in the water with the aid of gentle heat. Place the solution thus obtained in a bottle of about one and a half litres capacity. Add the oil *all at once* and shake. The product equals about 1000 c.c.

Non-Greasy Hair Creams are generally made with white powdered tragacanth and small quantities of glycerine. The gum is mixed with alcohol, the glycerine and perfumes added, and the whole transferred to a whisking machine. The water is poured in gradually until the volume is attained and the liquid is allowed to thicken. It is then strained through muslin and bottled. The following formula will give good results :—

Tragacanth	10 grams
Tincture of tolu	5 c.c.
Alcohol	50 „
Glycerine	20 „
Hydroxy-citronellal	2 „
Ylang-ylang oil	2 „
Linalol	5 „
Jasmin absolute	1 „
Water—to produce	1000 „

Note.—The success of this preparation depends very largely on the *quality* of the gum used. It should be the best.

Hair Curling Applications are sold both in solid and liquid forms. Their purpose is to saponify the natural fat of the hair so that when it dries the curl will be more permanent. They are made with the alkaline carbonates or borax, and a gum is often added.

Powder Form.

Sodium carbonate—dried	750 grams
Powdered acacia	240 „
Musk xylol	5 „
Rose-geranium oil	5 „

Mix and direct a small dessertspoonful to be dissolved in a cupful of hot water and sprinkled on the hair before curling.

Liquid Form.

Potassium carbonate	40 grams
Borax	10 „
Mucilage of tragacanth	100 c.c.
Coumarin	5 grams
Methyl acetophenone	1 c.c.
Alcohol	100 „
Rose water—to produce	1000 „

Dissolve the borax and potassium carbonate in 500 c.c. of rose water, mix the other ingredients, and add.

Make up to volume.

Depilatories are used for removing superfluous hairs. They consist principally of *freshly prepared* barium sulphide and starch. Variations are made by the addition of French chalk, zinc oxide, etc., but the barium salt in all cases is the effective ingredient. The powder is made into a paste with a little warm water and applied to the skin. It is allowed to remain in contact for about two minutes and is then carefully removed. Any irritation or redness which may ensue is relieved by the free application of a fatty cream. Here are two formulæ :—

A.

Barium sulphide	250 grams
Corn starch	750 „
Musk ketone	1 gram

B.

Barium sulphide	200 grams
French chalk	200 „
Zinc oxide	100 „
Starch	500 „
Phenylacetic aldehyde	0·5 gram

Mix the powders and pack in closed jars or bottles.

Hair Fixers are used principally for keeping the moustache in any desired position, and are generally sold in tubes or sticks. They are frequently compounded from pomades to which has been added beeswax or ceresine. They are coloured according to taste, and oil-soluble dyestuffs are better for the purpose than pigments.

White.

White beeswax	250 grams
Ceresine—white	10 „
Oleo-resin orris	5 „
Violet pomade	500 „
Cassie „	200 „
Jasmin „	30 „
Ionone alpha	5 c.c.

Black.

Yellow beeswax	200 grams
Yellow ceresine	50 „
Yellow paraffin jelly	250 „
Benzoated lard	445 „
Oil black	5 „
Cocoa butter	50 „
Hydroxy-citronellal	5 c.c.
Vetivert oil	0·1 „
Cananga oil—terpeneless	3 „

Melt the fats, and when an oil-dye is used, add this and cool—add the perfume and mould.

Liquid Hair Fixers are merely alcoholic solutions of gum-resins, such as benzoin, colophony, sandarac, mastic, etc., suitably perfumed. They are applied to the moustache with a tooth brush, and the hair is then mani-

pulated into any fancied form. The following formula will indicate their composition :—

Gum benzoin Siam . . .	100 grams
Mastic	10 „
Sandarac	50 „
Colophony	200 „
Amber liquid	5 c.c.
Jasmin synthetic	5 „
Alcohol 90 per cent—to produce .	1000 „

Rub down the solids, and transfer to a bottle containing 600 c.c. of alcohol. Place the bottle in hot water, and shake occasionally until solution has been effected. Cool and filter bright. Add the perfumes and alcohol to volume.

Hair Lotions and Tonics are frequently the subject of a jest, as they are expected to make hair grow on the baldest heads. While they may not be a guaranteed specific, they undoubtedly have a stimulating effect upon the hair follicles, and the friction produced either by the fingers or by a fairly stiff brush is not by any means a negligible factor contributing to their efficacy. Among the active ingredients in this type of preparation may be mentioned the following :—

Jaborandi tincture	or	Pilocarpine
Cantharides „	„	Cantharidin
Cinchona „	„	Quinine
Ammonia	„	Borax
Tartaric acid	„	Acetic acid
Rosemary oil		
Camphor		
Capsicum, preferably in the form of tincture		

Glycerine is included in the majority of formulæ. Since it is left on the scalp after the evaporation of the more volatile constituents, its inclusion is sometimes objected to, the hair having a tendency to remain greasy. The *perfume* should receive mature consideration, as when some of the above-mentioned materials are employed their odour is difficult to cover. Rosemary oil is one of the most popular perfumes, and it also possesses the

advantage of being a good hair stimulant. Here are two formulæ for **Rosemary** and **Cantharides Hair Wash**:—

A. (Acid).

Acetum cantharides	15 c.c.
Alcohol	150 „
Rosemary oil	15 „
Bergamot oil	10 „
Lavender oil	5 „
Provence rose oil	5 „
Glycerine	50 „
Water—to produce	1000 „

B. (Alkaline).

Tincture of cantharidin	5 c.c.
Solution of ammonia	50 „
Glycerine of borax	75 „
Rosemary oil	10 „
Alcohol 90 per cent	125 „
Triple rose water	200 „
Triple orange flower water	300 „
Water—to produce	1000 „

Dissolve the oils in the spirit and the glycerine of borax in the concentrated waters. Mix the two solutions and make up to volume with water—filter bright, using talc or kieselguhr.

Cantharides Tonics are made on the following lines:—

C.

Tincture of cantharides	10 c.c.
Borax	40 grams
Glycerine	50 c.c.
Sal volatile	2 „
Ionone 100 per cent	1 „
Bergamot oil	5 „
Cananga oil	2 „
Alcohol	50 „
Water—to produce	1000 „

D.

Cantharidin	0·02 gram
Acetic æther	1 c.c.
Acetic acid, glacial	6 „
Bay rum	250 „
Glycerine	50 „
Water—to produce	1000 „

Dissolve the cantharidin in the acetic æther, and add to the bay rum. Then proceed as above.

Jaborandi Hair Washes may be compounded as follows :—

E.

Tincture of jaborandi leaves	50 c.c.
Tartaric acid	5 grams
Rose-geranium oil	6 c.c.
Lavender oil	2 „
Bergamot oil	2 „
Alcohol	50 „
Glycerine	70 „
Triple rose water—to produce	1000 „

Better preparations are made by using the alkaloid *Pilocarpine*, as follows :—

F.

Pilocarpine nitrate	0·5 gram
Tincture of cantharidin	10 c.c.
Alcohol	90 „
Heliotropin	5 grams
Verbena oil	3 c.c.
Lavender oil	2 „
Glycerine of borax	50 „
Water—to produce	1000 „

Quinine Hair Tonics are more often made from the alkaloid than its mother substance cinchona. The hair stimulant properties of these bodies appears doubtful in spite of their comparatively large sale :—

G.

Quinine sulphate	2 grams
Tincture of cantharidin	8 c.c.
Eau de Cologne	750 „
Iso-butyl salicylate	5 „
Glycerine	50 „
Orange flower water—to produce	1000 „

Dissolve the alkaloid in the cologne, add the tincture and the iso-butyl salicylate. Mix the glycerine with 200 c.c. of the water, and add.

H.

Quinine hydrochloride	3 grams
Pilocarpine hydrochloride	1 gram
Lavender water	200 c.c.
Glycerine	20 „
Triple rose water—to produce	1000 „

Dissolve the alkaloidal salts in the lavender water, and proceed as above. Filter bright, if necessary.

Pomades for the hair were at one time most popular, and consisted principally of exhausted greases from the enfleurage and maceration processes. They have a very restricted sale to-day, and are seldom made with this raw material, being more often composed of lard, fixed oils, and sometimes paraffin hydrocarbons. In many cases they are supposed to possess tonic properties for the hair, when it is usual to add traces of bodies such as *cantharidin* and *pilocarpine*. Pomades are apt to go rancid, and in order to prevent this the fats, before perfuming, are benzoinated by digestion with Siam or Sumatra benzoin, or for preference by dissolving a small quantity of *benzoic acid* in the melted greases.

As a rule these products are cheap, and therefore the quantity and quality of the perfume used is not very important. The oils of bergamot, neroli, petitgrain, verbena, lemon-grass, citronella, and clove are in common use, while the synthetics employed include terpineol, dimethyl hydroquinone, coumarin, methyl acetophenone, etc.

The *mode of preparation* is simple: The fats are melted and benzoinated. They are then strained through a piece of lint or linen to remove extraneous matter. After cooling, the perfume is added, and they are then filled into pots. It is important that the temperature should not be high, or else the fats will contract at solidification, and come away from the sides of the jar. The product then assumes an unsightly appearance.

Almond Pomade.

Almond oil	400 grams
Benzoinated lard	550 „

Almond Pomade *continued.*

White wax	50 grams
Coumarin	5 „
Methyl acetophenone	1 c.c.
Benzaldehyde	0·5 „
Balsam Peru	3·5 „

Benzoin Pomade.

Lard	950 grams
Siam Benzoin	10 „
Japan wax	50 „
Amber liquid	2 c.c.
Jasmin synthetic	3 „
Rose-geranium oil	5 „
Bergamot oil	10 „

Castor Oil Pomade.

Castor oil—white	500 grams
Peach kernel oil—bleached	150 „
White beeswax	50 „
Rose pomade (genuine)	300 „
Rhodinol	7 c.c.
Linalyl acetate	3 „

Cantharidin Pomade.

Lard	600 grams
Benzoic acid	5 „
White petrolatum	380 „
Ceresine—white	20 „
Cantharidin	0·1 „
Acetic æther or chloroform	20 c.c.
Terpineol	3 „
Hydroxy—citronellal	2 „
Cananga oil	2 „
Iso-eugenol	1 „

Dissolve the cantharidin in the chloroform or acetic æther and add to the cooled and strained fats. Add the perfumes and pot.

Coloured Pomades are made as described above, with the addition of either an oil-soluble dye, or in the case of *yellow* by the use of yellow soft paraffin as one of the bases, *red* by digestion of the base with alkanet, *green* by the addition of chlorophyll.

Circassian Cream (Red).

Benzoinated lard	600 grams
Castor oil	260 ,,
Beeswax	40 ,,
Alkanet root—crushed	25 ,,
Rose pomade	75 ,,
Benzylidene acetone	1 gram
Balsam of Peru	4 grams

Marrow Pomade (Yellow).

Beef marrow	100 grams
Olive oil	200 ,,
Paraffin jelly—yellow	500 ,,
Benzoinated lard	175 ,,
Yellow wax	25 ,,
Citral	1 c.c.
Iso-eugenol	3 ,,
Linalyl acetate	3 ,,
Citronellol	3 ,,
Tolu balsam	10 grams

Elder Flower Pomade (Green).

Pea-nut oil	440 grams
Chlorophyll	0·5 gram
Yellow beeswax	60 grams
Soft paraffin—yellow	500 ,,
Linaloe oil	3 c.c.
Terpineol	4 ,,
Bergamot oil	3 ,,
Geraniol	5 ,,
Oakmoss resin	0·1 ,,

Macassar Pomade (Red).

Ceresine red	70 grams
Lard	320 ,,
Benzoic acid	5 ,,
Almond oil	300 ,,
Castor oil	300 ,,
Lanoline	10 ,,
Lavender oil	3 c.c.
Rosemary oil	1 ,,
Bergamot oil	5 ,,
Pelargonium oil	1 ,,
Musk ambrette	1 gram
Benzyl benzoate	4 c.c.
Oil red base	0·1 gram

Hair Restorers are made with sulphur and a lead salt. The *calcareous* form of precipitated sulphur yields the best product and may be used in conjunction with lead *acetate*. Here is a good formula :—

Precipitated sulphur (calcareous) .	25	grams
Lead acetate	30	„
Glycerine	45	c.c.
Rose synthetic	1	„
Phenylacetic acid . . .	0·2	gram
Water—to produce	1000	c.c.

Rub down the sulphur to a smooth paste with the glycerine and add the perfumes. Dissolve the lead acetate in 500 grams of the water and gradually add to the former, stirring all the time. Make up to volume and when bottling be sure that the insoluble portion is evenly distributed.

Other forms of applying such products consist of precipitating the sulphur in the hair follicles. This is done by rubbing into the scalp, first—a solution of sodium hyposulphite (hypo) ; second—a dilute solution of hydrochloric acid.

Shampoos, both solid and liquid, have a tremendous sale, and the comparatively recent introduction of cocoa-nut oil —saponified—has materially increased the demand for the liquid type. As the powder form is most common, it will be treated first.

The bases in common use are :—

Sodium sesquicarbonate
Sodium carbonate—dried
Borax
Saponine
Powdered soap.

The proportion of soap varies, and it is always advisable to have other bases with it, otherwise it has a tendency to clot the hair. Saponine is useful to increase the lather. The alkaline bases saponify the grease, and it is washed away while rinsing. The perfumes almost invariably include one of the artificial musks, and the *xylol* is most

economical to use. Oils such as lavender, rosemary, and rose geranium are much employed.

The method of manufacture of all shampoo powders is simple, especially when the machine illustrated on page 336 is used for the purpose. The perfumes are rubbed down in a mortar with one of the ingredients, preferably borax when it is used, and then the whole is sifted and mixed twice—a sixty-mesh sieve gives the desired fineness.

Some formulæ are given :—

Heliotrope.

Borax	200 grams
Dried carbonate of soda	600 „
Powdered soap	200 „
Musk xylol	5 „
Piperonal vanillone	5 „

Violet.

Sodium sesquicarbonate	500 grams
Sodium biborate	250 „
Soap powder	250 „
Ionone alpha	5 c.c.
Violettophyx	5 „

Lavender.

Sodium carbonate	600 grams
Soap powder	400 „
Bergamot oil	5 c.c.
Musk ketone	2 grams
Lavender oil[1]—French	5 c.c.

Rosemary.

Borax	250 grams
Crex	400 „
Saponine	50 „
Castile soap powder	300 „
Musk xylol	3 „
Rosemary oil	5 c.c.

Henna Shampoos are very popular since they are supposed to dye the hair very slightly :—

[1] For cheaper kinds use spike lavender oil.

Henna powder	50 grams
Borax	150 „
Sodium carbonate	250 „
Potassium carbonate	50 „
Soap powder	500 „
Musk xylol	5 „
Amyl salicylate	4 c.c.
Iso-eugenol	1 „

Darker tints are obtained with the following :—

Henna powder	100 grams
Borax	100 „
Potassium carbonate	50 „
Sodium carbonate	400 „
Castile soap—powdered	300 „
Saponine	50 „
Musk ketone	3 „
Patchouli oil	1 c.c.
Jasmine	4 „
Olibanum R.	2 „

Chamomile Shampoos are of recent introduction, and are believed to darken the hair :—

Powdered chamomile flowers	50 grams
Borax	250 „
Sodium carbonate dried	500 „
Saponine	20 „
Soap powder	180 „
Oil of chamomile	1 gram
Amber liquid	4 grams

Dry Shampoos are made *without* soap, the above-mentioned alkaline bodies being supplemented with such materials as starch, orris, fuller's earth, etc. They are rubbed into the hair before retiring and brushed out again next morning with a stiff brush :—

Borax	50 grams
Sodium sesquicarbonate	150 „
Starch	500 „
Orris root powder	300 „
Musk ambrette	2 „
Coumarin	5 „
Heliotropin	3 „

Liquid Shampoos have a great advantage over the powdered kinds, since they contain no solid matter, and are therefore easily washed from the hair.

The use of soft soap makes a simple preparation as follows :—

Soft soap (from olive or linseed oil)	100 grams
Alcohol	250 c.c.
Lavender oil	5 „
Rosemary oil	2 „
Rose-geranium oil	3 „
Solution of potash (5 per cent)	50 „
Water—to produce	1000 „

Dissolve the soap in the alcohol and add the oils—mix the solution of potash with 600 c.c. of water and add gradually. Make up to volume.

An improved form may be made as follows :—

Green soft soap	50 grams
Alcohol	150 c.c.
Violet synthetic	10 „
Saponine	20 grams
Liquid ammonia	20 c.c.
Water—to produce	1000 „

Proceed as above described—dissolving the saponine in the water.

Liquid Dry Shampoos are made on similar lines, but with a larger proportion of alcohol. They are generally tinted green :—

Soft soap (green)	75 grams
Industrial spirit	500 c.c.
Violet synthetic	5 „
Strong solution of ammonia ·880	5 „
Distilled water	500 „

Dissolve the soap in the alcohol and add the perfume. Mix the ammonia with the water and gradually add to the former solution. Stand aside for one week and filter bright, using kieselguhr if necessary.

Here is another type :—

Liquid ammonia ·880	25 c.c.
Eau de Cologne	400 „
Tincture of quillaia	275 „
Alcohol	300 „

and another :—

Liquor ammonia fort. . . .	40 c.c.
Saponine	20 grams
Bay rum—industrial . . .	940 c.c.

Cocoa-nut Oil Shampoos, frequently termed **Emulsified,** are made by saponifying *odourless* Cochin oil with potash. Sometimes other fixed oils are added and these include, palm, pea-nut, etc., but they have a tendency to decrease the foaming properties of the product and are only used in cheaper grade articles. One thousand grams of cocoa-nut oil require for complete saponification about 260 grams of KOH, calculated as absolute, but since commercial samples average between 78 and 88 per cent only (x), the approximate amount (y) will be calculated thus :—

$$1000 \text{ grams C.N.O. require } \frac{260 \times 100}{x} = y.$$

This is dissolved in 1 litre of water at about 75° C. and added to the oil at the same temperature in a steam pan. The reaction may be controlled by using phenolphthalein as indicator—if the liquid remains *white,* further additions of alkali are necessary, whereas when it turns *red,* more oil should be added. The heat is continued until saponification has taken place and the product is *neutral.* It is then diluted to 5 litres with distilled water in which has been dissolved some carbonate of potash.

The formula now reads :—

Cocoa-nut oil	1000 grams
Potassium hydroxide . . .	y „
Distilled water	1000 c.c.
Potassium carbonate . . .	30 grams
Distilled water—to produce . .	5000 c.c.

It is now perfumed with any of the stable synthetics such as linalol, terpineol, methyl acetophenone, etc., or such oils as lavender and rosemary.

The liquid soap is left to deposit and the clear solution decanted as required.

It should be noted that some products contain sugar,

chlorate of potash, and even additions of glycerine. Potash lye of known strength may be substituted for the raw material if it is a stock line. Soda lye is never used as it yields soaps which cloud rapidly.

Pine Tar Liquid Shampoos may be prepared on the same lines as the above, with the addition of about $2\frac{1}{2}$ per cent of pine tar. A formula is appended :—

Pine tar	25 c.c.
Raw linseed oil	225 ,,
Olive oil	100 ,,
Industrial spirit	50 ,,
KOH	*y* grams
Water—to produce	1000 c.c.

Proceed as above.

Note.—The quantity of alkali is calculated as above, excepting that the saponification values of the oils are different.

Henna Liquid Shampoo is made by first preparing an infusion of henna as follows :—

Powdered henna leaves	100 grams
Boiling water	1 litre

Infuse for half an hour and then filter bright.

Take of this solution	100 c.c.
Soft soap (green)	300 grams
Alcohol	200 c.c.
Lavender oil	20 ,,
Oakmoss resin	1 ,,
Water—to produce	1000 ,,

Dissolve the soft soap in the alcohol and add the oils, henna infusion, and water to volume. Stand aside seven days and filter bright.

CHAPTER IV.

LIP SALVES[1] AND ROUGE STICKS.

1. Bases.
2. White lip salves, hard and soft.
3. Rose lip salves.
4. Rouge sticks.
5. Lip jellies, white, rose, and rouge.
6. Greaseless lip rouge sticks.

CRAYONS for the lips are sometimes used to prevent chapping or cracking, but more frequently they are employed to impart colour and life to the mouth. In many products there is a distinct tendency towards artificial shades which may not be discreet, but are, nevertheless, in great demand by a certain class of customer. Among the **Bases** from which lip salves may be compounded are the following :—

Almond oil.	Hard paraffin.
Peach kernel oil.	Ceresin, white or red.
Liquid paraffin.	Cocoa butter.
Lanolin, anhydrous.	Spermaceti.
Soft paraffin, white.	White beeswax.

White Lip Salve is made in both *hard* and *soft* forms, and as healing properties are generally desirable, lanolin is often included in the formula. Almond or peach kernel oils, cocoa butter, and spermaceti are also good for this purpose. **Hard** kinds usually have a melting-point about 45° C., and are made as follows :—

[1] By a recent excise order this word renders the preparation liable to patent medicine stamp duty if the formula is not disclosed. It is advisable therefore to chose some other designation such as lip *stick*.

A.

White beeswax	250	grams
Spermaceti	300	„
Liquid paraffin	450	c.c.
Coumarin	1	gram

B.

Lanolin, anhydrous	100	grams
Liquid paraffin, 0·860	400	c.c.
Cetaceum	500	grams
Vanillin	1	gram

C.

White wax	300	grams
Peach kernel oil	700	c.c.
Rose otto	1	gram

Soft kinds are more greasy when used, and may be made as follows :—

A.

Lanolin, anhydrous	100	grams
Theobroma oil	900	„
Benzyl acetate	1	c.c.

B.

Spermaceti	100	grams
Almond oil	100	c.c.
Cocoa butter	800	grams
Benzyl cinnamate	1	c.c.

C.

Lanoline, anhydrous	150	grams
Soft paraffin, white	500	„
Hard paraffin	350	„
Coumarin	1	gram
Musk ketone	0·5	„

Melt the fats on a water bath, and when cool add the perfume. Run into moulds, which will give the desired shape to the stick. White lip salves are generally round, but may be of the flat shape adopted nowadays for rouge.

Rose Lip Salves are nothing more than the white which have been tinted, but do not contain enough pigment

to colour the lips. One of the articles much used for this purpose is alkanet root—the desired tint being obtained by experiment (5 per cent is a reasonable amount). In order to obtain the colour the salve is digested on a water bath with the cut roots for two hours and afterwards strained. The perfume is added after cooling. This method is rather wasteful since the alkanet absorbs quite an appreciable quantity of fats, and in consequence it is often desirable to use other forms of pigment. Nothing is better than an oil-soluble colour, and these are obtainable from any of the dyemakers. It is sometimes difficult to get the exact tint required, but good results may be had by mixing suitable quantities of red and violet. It would not be advisable to give figures here as the tint is a matter of personal taste. Should any difficulty be experienced certain of the *basic* dyestuffs may be made soluble in oil by digestion with *stearic acid* before incorporation with the base.

Rouge Sticks are almost invariably coloured with carmine, either with or without treatment with alkali. This depends upon the tint required. It should be noted that the user of a lip stick desires a colour effect rather than a greasy one, and therefore these products are generally made fairly hard and with a maximum percentage of pigment. The ideal lip rouge will rub on smoothly and not come off with the soup! The carmine content should not exceed 20 per cent, but the majority are made with much less. If a bright colour is desired, it can be obtained by the addition of zinc oxide. The general method of manufacture consists of melting and straining the fats and rubbing down the pigment in a warmed mortar with them, but for large-scale production, where a perfectly fine, smooth, and grainless article is desired, the warmed mass should be *milled*. This may be accomplished with either a paint or an ointment mill, and the subsequently liquefied product should be run into plated moulds—the flat shape of stick being most in demand and easier to use. Formulæ are appended :—

A.

Carmine no. 40	200 grams
Paraffin liquid ·890	300 c.c.
Lanolin anhydrous	150 grams
Ceresine (high m.p.)	350 „
Linalyl cinnamate	1 c.c.

B.

Carmine no. 40	150 grams
Soft paraffin—white	550 „
Spermaceti	300 „
Anisic aldehyde	1 c.c.

C.

Carmine	100 grams
Zinc oxide	50 „
Ceresine	300 „
Almond oil	50 c.c.
Soft paraffin—white	500 grams
Piperonal-vanillone	1 gram

D.

Carmine	50 grams
Ammonia	a sufficient quantity
White wax	450 grams
Peach kernel oil	500 c.c.
Benzyl propionate	1 „

It will be found easier to manipulate those formulæ containing either liquid paraffin or a fixed oil, as the carmine can then be rubbed down in a cold mortar and afterwards added to the melted fats.

Lip Jellies are obtained by using finest white sheet gelatine as the solidifying agent. Advantage is taken of the fact that 2 per cent of a good quality gelatine, when dissolved in water, will set to a soft jelly—harder products being obtained by increasing the amount. Glycerine up to 75 per cent is added to prevent the lips cracking, but in coloured varieties much less than this is used. Any of the colours given under *rouges* may be employed, and the desired tint obtained by experiment. A favourite perfume is rose, but other oils such as jasmin, lavender, etc., may be used. The addition of some formaldehyde is desirable,

since it preserves the product. Lip jellies are generally sold in tubes and occasionally in pots.

White.

Glycerine	750 grams
Gelatine	20 „
Formaldehyde solution (40 per cent)	10 „
Rose otto	1 gram
Distilled water—to produce	1000 grams

Rose.

Glycerine	500 grams
Gelatine	25 „
Eosine (1 per cent solution)	2 „
Formaldehyde solution	20 „
Benzyl formate	1 gram
Distilled water—to produce	1000 grams

Rouge.

Carmine	50 grams
Strong solution of ammonia	a sufficient quantity
Glycerine	100 grams
Gelatine	30 „
Linalol	2 c.c.
Water—to produce	1000 grams

Rub down the carmine in a mortar and add the fluid ammonia until dissolved—dilute with 600 c.c. of water and stand aside for a week. Pour off the clear liquid and add it to the glycerine. In the meantime dissolve the gelatine in 100 c.c. of hot water—then mix the liquids, and when cool add the perfume. This is very effective for colouring the lips.

Note.—Liquid preparations of this type are made by omitting the gelatine and formaldehyde.

Greaseless Lip Rouge Stick.—It is generally admitted that the stick form of lip colouring can be more easily applied than either the jelly or liquid (described elsewhere), but the only disadvantage attendant upon the use of this form is that the colour may come off—perhaps sooner than is desired. These drawbacks are completely overcome by the use of glyceryl borate containing a dye, but they must always be sold in close-fitting cases in order to prevent any

undue moistening—the result of the hygroscopic nature of the base. The formula is as follows :—

Glycerine	800 grams
Boric acid crystals	600 „
Eosine scarlet (5 per cent solution in triple rose water) . . .	20 c.c.

Weigh the glycerine in a tared porcelain dish and add the boric acid and dye solution (the latter will immediately turn yellowish-brown). Apply direct heat to the mixture, taking care that the temperature does not exceed 150° C., and boil until the weight is reduced to 1000 grams. Run into plated moulds *immediately*. The transparent glass-like rouge stick can be removed in about five minutes and packed as above described. For use, the lips should be moistened and the stick applied two or three times according to the tint desired (the colour of the dye assumes its normal shade in the presence of water).

CHAPTER V.

MANICURE PREPARATIONS.

1. Preliminary treatment of hands, soft waters, softening creams.
2. Cuticle removers, nail bleach.
3. Nail polishes, powder, liquid, and paste.
4. Wax polishes, liquid, and paste.
5. Nail varnishes.

MANICURE has been brought almost to a fine art, very largely through the enthusiasm and business acumen of our American friends. At one time the idea of *varnishing* the nails would have seemed ludicrous ; to-day it is practised by most women and many men. The perfectly manicured hand is not entirely the result of the artistic application of the products which will be described in this chapter, but is more often due to the habitual care exercised in washing them and some preliminary treatment which takes effect during the hours of repose.

Preliminary Treatment.—The hands should be washed in soft and soapy water three or four times each day. The nails should never be scrubbed with a hard brush, as this has a tendency to lacerate the cuticle. If a brush must be used—employ a soft one. If the water is hard, soften it with a mixture such as the following—a tablespoonful to a basin of water is sufficient :—

Glycerine	100 grams
Borax	30 ,,
Sodium carbonate	20 ,,
Orange flower water, triple . .	850 c.c.

Dissolve the solids in the mixed liquids.

The healthy condition of the cuticle is very necessary, and this can be maintained by the nightly application of a softening cream—loose gloves being worn to allow of complete absorption. This at the same time prevents the nails becoming brittle and ribbed. Such creams almost invariably contain soap, and preference is given to soft potash varieties. They are made as follows :—

A.

White beeswax	10 grams
Soft paraffin—white	950 „
Soft soap	40 „
Lavender oil	5 c.c.

Melt the ingredients together.

B.

White wax	160 grams
Lanoline, anhydrous	40 „
Paraffin liquid ·860	500 „
Borax	10 „
White soft soap	50 „
Water	240 „
Ionone beta	2 c.c.

Melt the fats and heat to 80° C., dissolve the soap and borax in the water at the same temperature, pour the latter into the former and stir, incorporate the perfume.

The first manicure operation proper consists of filing the nails in an upward direction from the sides, any imperfect edges being smoothed with an emery board.

Cuticle Remover is next applied on a small piece of cotton wool with an orange stick. It is worked round the edges and under the tips of the nails, and the dead cuticle is removed with another piece of wool. The most effective type of solution is made with caustic potash and glycerine as follows :—

KOH, 85 per cent	20 grams
Glycerine	200 „
Water	800 „
Bergamot oil—terpeneless	1 c.c.

Dissolve the KOH in the glycerine and water, add the perfume, and pack in rubber corked bottles.

Nail Bleaches are used for removing discolorations, ink stains, etc. They consist of solutions of dilute acids, salts of lemon, hydrogen peroxide, etc. Some formulæ are appended :—

A.

Acid hydrochloric, pure	4 c.c.
Glycerine	100 „
Rose water, triple	900 „

B.

Tartaric *or* citric acids	50 grams
Orange flower water, triple	950 c.c.

C.

Oxalic acid	15 grams
Phenylacetic acid	1 gram
Water	1000 c.c.

D.

Potassium binoxalate	10 grams
Lavender water	50 c.c.
Distilled water	950 „

E.

Hydrogen peroxide—20 vols.	500 c.c.
Glycerine	100 „
Rose water	400 „

Note.—Use indiarubber corks for all the bottles in which these products are packed.

The hands are next dipped in warm water to remove any of the cuticle or bleach applications which may have been used, and, while drying with a towel, the cuticle is pressed gently but firmly backwards.

The nails are now burnished—the operation consists of rubbing them lightly across the inside of the hand, to which has previously been applied one of the following products, or of applying the polish on a chamois pad or burnisher.

Nail Polishes (Powder) are made principally from stannic oxide (putty powder), but among the other possible constituents are :—

Kaolin.
Kieselguhr.
Zinc oxide.
French chalk.
Pumice powder.
Heavy precipitated chalk.
Tin oleate.

The majority of them are tinted with either carmine or a dyestuff such as eosine (dissolved in water). The powders are triturated in a mortar and sifted.

A.

Tin oxide	700 grams
Talcum	200 „
Zinc oxide	100 „
Bengal red	0·1 gram
Hydroxy-citronellal	2 grams

B.

Kaolin	200 grams
Heavy chalk (precipitated)	300 „
Tin oxide	500 „
Erythrosine	0·1 gram
Methyl naphthyl ketone	4 grams

Liquid Nail Polishes may be prepared from any of the above if desired by adding an equal quantity of water and a suspending agent, such as tragacanth, together with some glycerine. *Stannous chloride* is sometimes used, and may replace tin oxide in the following formula :—

Stannic oxide	300 grams
Talcum	300 „
Osmose kaolin	100 „
Tragacanth	2 „
Glycerine	50 c.c.
Citral	1 „
Water—to produce	1000 „

Rub down the powders in a mortar, add the glycerine, perfume, and water to volume. Colour if desired, and pass the whole through fine muslin before bottling. Shake before use.

Paste Nail Polishes may be prepared from any of the powders by the addition of *glycerine of tragacanth or starch.*

Blocks or **Sticks** are made from the powders by massing with *mucilage of tragacanth* and allowing to dry at normal temperatures—heating makes them crack.

These products are generally wrapped in tinfoil and sent out in suitable packages.

Wax Polishes are not considered to be so effective as the foregoing. They are made with white wax, ceresine, spermaceti, and soft paraffin. An example follows :—

White beeswax	100 grams
Ceresine—white—high M.P. . .	100 „
Soft paraffin—white	800 „

Melt together and fill into small pots.

Liquid Wax Polishes may be prepared as follows :—

White wax	25 grams
Hard paraffin	50 „
Chloroform	1000 „

Dissolve in the cold and pack in stoppered bottles.

If any of the polish remains on the hands or under the cuticle, etc., it may be removed with soap and warm water. When dry, the nails are varnished. The most brilliant enamel is made with *benzoin;* others are made with celluloid and the tri-acetyl cellulose.

Benzoin Nail Enamel is conveniently prepared from the resinodor as follows :—

Benzoin R.	200 c.c.
Alcohol	400 „
Ether meth. ·735	400 „
Methyl acetophenone . . .	1 „
5 per cent solution of eosine . .	0·2 „

Mix the liquids and apply to the nails with a camel's-hair brush. Allow the first coating to dry three minutes, and then apply a second one. Dry for ten minutes, and then polish with a silk handkerchief.

A perfect result is obtained and the nails will remain brilliant for several days.

Celluloid Enamels are made by dissolving cleaned cinema films in a mixture of amyl acetate and acetone as follows :—

Celluloid	25 grams
Methyl paratolyl ketone	1 c.c.
Amyl acetate	250 „
Acetone	750 „
Phloxine P.	0·1 gram

Warm slightly if necessary—the product is of a syrupy consistency.

Triacetyl Cellulose does not give such good results, as the nails are apt to show white streaks. Here is a formula :—

Cellulose acetate	25 grams
Tetra chlor. ethane	550 c.c.
Acetone	450 „

Dissolve the cellulose in the T.C.E. by allowing them to stand together in a well-closed vessel for two days. Then add the acetone and perfume with iso-eugenol 10 c.c. Colour to taste.

CHAPTER VI.

SKIN CREAMS AND LOTIONS.

1. Introduction.
2. Cold creams, vegetable and mineral.
3. Blush creams, solid and liquid.
4. Vanishing creams, manufacture, alkalis, glycerine, pearliness, stability, perfume, formulation. Witch hazel foams, peroxide creams.
5. Lanolin creams.
6. Tragacanth and benzoin creams, solid, liquid, and virginal milk.
7. Almond creams.
8. Glycerine and cucumber creams, cucumber juice, lait d'Iris, honey and almond cream.
9. Lotions, complexion beautifiers, buttermilk and bleaching.
10. Freckle applications.
11. Sunburn lotions and liquid face powder.
12. Glycerine jellies, camphor ice.

THE use of salves and unguents for preserving and beautifying the skin dates back to earliest antiquity, when they were generally prepared by digesting aromatic gum-resins, roots, flowers, etc., with fats and oils. The first notable change in the constitution of these cosmetics appears to have been made about the second century A.D., when the Greek physician Galen (who practised in Rome) added *water* to his salves, and by so doing laid the foundation of our modern *cold cream.* This is probably the only skin application which has stood the tests of time successfully, and although there is little doubt that it has been much modified, the principle remains the same.

More recently other cosmetic creams have been introduced, and they have passed from *Milk of roses* to *Cucumber creams* and from these to the present day *Vanishing creams.*

There is, however, a marked difference between the latter and all the others. These exhibit distinct emollient properties, whereas vanishing creams do not. Indeed, it is doubtful if such products have any intrinsic worth other than that of a protective agent against winds and the sun. Of course their real value to milady is as a basis for her face powder, which adheres more perfectly when this is applied and evenly rubbed into the epidermis.

A vanishing cream, therefore, cannot be said to be of much value *alone*, whereas it undoubtedly plays an important rôle in the toilet if used in conjunction with face powder.

Cold Cream is an emulsion in which the fat predominates, but the cooling effect produced when it is applied to the skin is due to the slow evaporation of the water contained. The bases in general use at one time were almond oil, lanolin, and white wax, but the oil has now been largely replaced by liquid paraffin, since it will not become rancid on keeping. Spermaceti is sometimes used instead of, or in conjunction with, white beeswax, and traces of borax are occasionally added to aid emulsification. The perfume generally used is rose—either as aqua rosæ or by the addition of otto. The method of manufacture is simple *when borax is used*, and consists of melting the wax in a water bath, adding the oil, and warming the whole to about 80° C. The aqueous portion containing the borax is heated to this temperature and stirred in slowly. The perfume is added when cool, and the cream is potted liquid if a brilliant white surface is desired. When an emulsifying agent is *not* used, manipulation is more tedious, and the cream has to be stirred for a prolonged period if good results are desired.

Vegetable Cold Creams may be made to the following formula :—

Almond oil	550 c.c.
White wax	150 grams
Borax	10 „
Water	290 c.c.
Rose otto	5 „

Modifications with spermaceti may be prepared as follows :—

Peach kernel oil	600 c.c.
Spermaceti	20 grams
White wax	160 „
Borax	5 „
Triple rose water	215 c.c.
Phenylethyl alcohol	5 „
10 per cent solution aldehyde C_9	0·1 „

or *without* borax as below :—

Almond oil	500 c.c.
Lanolin anhydrous	30 grams
Spermaceti	70 „
White wax	100 „
Water	200 c.c.
Pelargonium oil	10 „

The addition of *zinc oxide* makes these preparations whiter, and it must be rubbed down to a smooth cream with some of the oil before mixing with the bulk. The procedure is then as above described :—

Almond oil	590 c.c.
White wax	180 grams
Lanolin anhydrous	20 „
Borax	10 „
Zinc oxide—finely sifted	20 „
Water	200 c.c.
Rose synthetic	2 „
Rose-geranium oil	3 „

Mineral Cold Creams may be prepared with petroleum oil of ·860 gravity as follows :—

Paraffin liquid	575 c.c.
White wax	175 grams
Lanolin	50 „
Borax	8 „
Water	200 c.c.
Rose otto—virgin	2 „
Benzoin R.	2 „
Amber liquid	1 „

Blush Creams are so called because when a little is applied to the cheeks, a delicate pinkish hue develops on exposure to the air. They are made in a similar way to cold creams, but with the addition of *alloxan* (*which see*). Here is a formula :—

Almond oil	600 grams
White wax	200 „
Alloxan	10 „
Water	200 c.c.
Bergamot oil	5 „
Neroli oil	2 „
Rhodinol	3 „

Melt the wax and add the oil. Dissolve the alloxan in the water, and incorporate this with the fats in a warm mortar. Add the perfume when cool, and continue to stir until the cream becomes quite white.

Liquid blush creams are merely solutions of alloxan in dilute glycerine and rose water, as follows :—

Alloxan	2 grams
Glycerine	100 c.c.
Rose water—to produce . .	1000 „

Dissolve.

Vanishing Creams are so called because they disappear when rubbed into the skin—that is, if they are made properly with the correct ingredients. They consist of stearic acid, partially saponified with alkali, the bulk of the fatty acid being emulsified by the soap thus formed. The main constituent is, of course, water.

Care should be exercised when purchasing **Stearic Acid**, and only the finest quality melting about 56° C. is of any use for first-class products.

The quantity of this raw material to be used in a vanishing cream varies according to the result desired ; it may be as low as 10 per cent, but should not exceed 25 per cent. For a good stable cream, about 20 per cent gives satisfactory results. The consistence of the cream does not necessarily depend upon the proportion of fatty acid present, but rather upon the amount saponified and

the nature of the alkali used for this purpose. For example, a difference is observed between the results obtained with soda and potash—the former makes a harder cream, that is assuming the ratio between their molecular weights are taken into account, *i.e.*

10 of NaOH = 14 of KOH.

Again the different percentages used of the *same* alkali in two creams will give different results. This is well illustrated by reducing the quantity of KOH from 14 grams to 10 grams in the first formula given below. Instead of getting a satisfactory product a very hard cream will be produced.

The *amount of fatty acid to be saponified* will vary according to the aim of the manufacturer, and will depend upon the composition of the cream to a very large extent. *Thirty* per cent should not be exceeded for "de luxe" products, and very often *less* will be found quite satisfactory. In order to arrive at the approximate quantity of *alkali* that will be required, the following points must be observed.

Stearic acid, $C_{17}H_{35}COOH$, has a molecular weight of 284. Supposing 1 kilo of cream is being prepared containing 200 grams of fatty acid, and it is desired to saponify 28 per cent of it—*i.e.* 56 grams—the quantity of alkali required will be calculated thus :—

$$\frac{\text{(molecular weight of alkali)} \times 56 \times 100}{284 \times \text{(no. of molecules as per equation)} \times (\%\ \text{purity of alkali})}.$$

To take a concrete example—caustic potash reacts with stearic acid as follows :—

$$C_{17}H_{35}COOH + KOH = C_{17}H_{35}COOK + H_2O.$$

The molecular weight of KOH is 56, and commercial samples average about 80 per cent strength.

The above calculation will therefore read :—

$$\frac{56 \times 56 \times 100}{284 \times 1 \times 80} = 14 \text{ grams nearly of commercial KOH.}$$

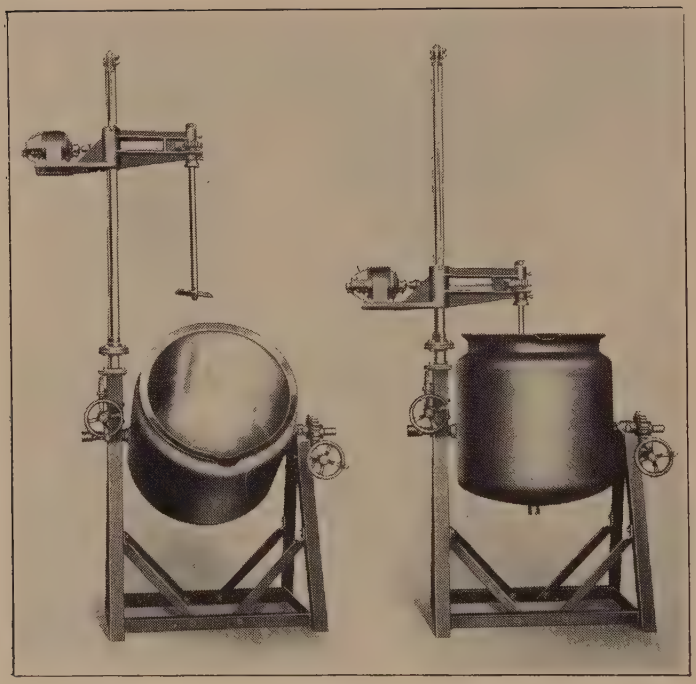
In order to assist the operator in arriving at his experimental quantity of alkali the following table is appended. The figures are based on the assumption that 1 kilo of cream will contain 200 grams of stearic acid, and no other fatty substance such as spermaceti, cocoa butter, almond oil, lard, etc. These bodies influence the consistence of the product, and some adjustment is usually necessary. Furthermore, an important part is played by manipulation which will be referred to later :—

Commercial Alkali.	Average Percentage Strength.	Formula.	Molecular Weight.	Approximate Weight Required.
Potassium hydroxide .	80	KOH	56	14 grams
,, carbonate .	81	K_2CO_3	138	16 ,,
Sodium hydroxide . .	90	NaOH	40	8 ,,
,, carbonate crystals	98	$Na_2CO_310 . H_2O$	286	28 ,,
Borax crystals . .	98	$Na_2B_4O_710 . H_2O$	382	37 ,,
Liquid ammonia ·880 .	32(NH_3) or 66(NH_4OH)	NH_4OH	35	10 ,,

Properties of Alkalis.—It is always better to use a *hydroxide* than a carbonate, since the gas (CO_2) liberated when the latter is added to stearic acid will not all escape. Assuming that the preparation were a thin liquid, the gas would readily come away and a perfectly clear solution would result, but since the soap and excess of fatty acid produce a viscous liquid, even while hot, it is practically impossible for the whole of the CO_2 to escape. Continuous trituration will not remove it, and after the cream has thickened and set, it will be found to be impregnated with numerous bubbles. In time these will rise to the top, and the cream will sink in consequence—a carbonate, therefore, possesses certain disadvantages.

Strong Liquid Ammonia has a tendency to discolour creams made with it. This is only observed after a time, and it is therefore not the ideal.

Borax is useful since it will produce a very white cream. The only disadvantage it possesses is that the product has a distinct tendency to grain.



[*By the courtesy of The Enamelled Metal Products Corporation, Ltd.*

FIG. 62.—Jacketed glass-lined "Pfaudler" Pan, suitable for the Manufacture of Skin Creams, etc.

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Sodium and Potassium Hydroxides are both good, and the advantage, if any, is with the use of the latter. Manipulation is facilitated and pearliness follows very closely in its train.

Glycerine is a constituent of many soap creams, and when used it should not exceed *ten* per cent. Half that amount is generally sufficient, and in Britain a distinct preference is shown for creams *without* it.

Manufacture. — The methods adopted in making vanishing creams are responsible, to a very large extent, for the appearance and texture of the resulting product. They must be standardised, and adhered to, for every batch if consistent results are to be obtained. The most general method consists of melting the stearic acid in a water bath to a temperature of about 85° C. The water (and glycerine if any) is brought to the same degree, and the alkali dissolved. This hot alkaline solution is gradually poured into the liquefied fat, while the whole is stirred briskly. The temperature is maintained at 85° C. for about ten minutes after all the hot alkali has been added in order to ensure that complete saponification has been effected—*i.e.* the existence of no *free* alkali in the cream. The container is removed from the source of heat, and stirring continued until the cream thickens and sets. This operation is still reverted to at intervals during the next twelve hours, and the temperature of the product is not allowed to fall below 20° C. The perfume is then added and the cream transferred to pots or jars.

Other methods are :—

1. Adding small lumps of solid stearic acid to the boiling alkaline solution.

2. Placing all the ingredients, excepting perfume, together in a pan—**cold**, and heating them until saponification is completed.

The advantages or disadvantages of such *modus operandi*, will be fully appreciated with practice.

Pearliness.—Much has been written regarding the satiny appearance of vanishing creams, and in order to induce it many substances and methods of manipulation have been recommended.

Among those materials which are said to produce it are : liquid paraffin, spermaceti, cocoa butter, starch, castor oil, almond oil, resin, etc., but since there are so many *degrees* of pearliness, these bodies can only truthfully be stated to yield a *shine*, and will not produce a silvery appearance approximating to that of powdered aluminium.

This peculiar effect is probably due to the crystallisation of the stearic acid in the minutest laminæ, from which the light is reflected at any angle, and strange as the statement may appear, *it can be easily obtained without the use of direct alkali.*

For the production of ordinary pearliness, an important part is played by *alcohol*, and also strict adherence to the method of manipulation described above.

It has often been suggested that prolonged beating of a vanishing cream will induce a satiny appearance. This is true to some extent, but it must not be forgotten that a very fluffy product will result, and as it will necessarily contain an undue amount of air, there will be a tendency to sink rapidly after packing.

Stability.—It is generally acknowledged that since soap creams contain a large proportion of water, they are very liable, under certain conditions, to lose some of it by evaporation. It is therefore imperative that the product should be packed in an airtight container, and the narrower the neck the better. Various devices are in use, and the best of them probably is the jar with a glass stopper pressed into a rubber ring which lies flat on the narrow neck of the container. The tightness of the joint is obtained by a screw cap fitting over the whole. When a glass stopper is not employed it is desirable that a piece of neutral board should fit over the top of the jar-neck, and the whole be coated with melted hard paraffin. All these devices, how-

ever, will be useless if the cream contains a lot of air, as this will come to the top in time, and the cream will sink accordingly. The use of gelatine, tragacanth, and starch has been recommended to hold up such creams, and while they are useful, products which are only slightly fluffy are better without them.

Perfume is a most important consideration in the preparation of this toilet requisite, and the best creams are always highly fragrant. If it is desired to bring a vanishing cream into a series, it will often be found necessary to adjust the formula of the perfume in order to obtain the same odour. Reference has been made in another part of this work to the fact that certain bodies have a tendency to discolour white creams, and on this account raw materials, such as indol and heliotropin, should be avoided. Excellent results may be obtained with bodies such as the following: ambers, artificial musks, patchouli, vetivert, ylang-ylang, and lavender oils, terpineol, linalol, methyl acetophenone, ethyl cinnamate, and dimethyl hydroquinone. The resinoids are also good and should not be overlooked.

A pleasant and persistent perfume can be made as follows:—

Coumarin	100 grams
Methyl naphthyl ketone	50 „
Hydroxy—citronellal	200 c.c.
Iso-butyl phenylacetate	150 „
Rose otto—virgin	50 „
Jasmin—*colourless*	50 „
Diphenyl methane	25 grams
Dimethyl hydroquinone	100 „
Styrolene acetate	25 c.c.
Para-methyl quinoline	50 „
Amber liquid	200 „

Formulation.—From the above remarks it will be seen that the proportions in which any of the ingredients may be used are very varied, and will depend upon the type of cream aimed at by the manufacturer. The formulæ given

below may therefore be adjusted to suit individual requirements—as they stand, they are workable, and will give good results :—

Potash Cream.

Stearic acid—triple pressed	200 grams
Potassium hydroxide—sticks	14 „
Water	800 c.c.
Alcohol 90 per cent	40 „
Perfume—to above formula	5 „

Dissolve the perfume in the alcohol, and beat it into the cream at 20° Centigrade.

Potassium Carbonate Cream.

Stearic acid	180 grams
Potassium carbonate crystals	12 „
Glycerine	50 c.c.
Water	750 „
Bergamot oil	4 „
Lavender oil	1 „
Ylang-ylang oil	1 „
Vetivert oil	0·5 „
Geranium R.	3·5 „

Maintain the temperature at least 20 *minutes*, with vigorous stirring from the commencement of saponification.

This will allow the greater part of the CO_2 to escape.

Soda Cream.

Stearic acid	180 grams
Caustic soda—sticks	9 „
Glycerine	50 c.c.
Water	760 „
Musk ketone	2 grams
Santalwood oil	1 c.c.
Vetivert oil	1 „
Amber liquid	6 „

Dissolve the NaOH in 360 c.c. of hot water and add to the fatty acid. Mix the glycerine with the remainder of the water at the same temperature and stir in.

Sodium Carbonate Cream.

Stearic acid	150 grams
Sodium carbonate crystals	20 „
Glycerine	150 c.c.

Sodium Carbonate Cream *continued.*

Water	650 c.c.
Alcohol	30 „
Methyl acetophenone	0·5 „
Benzylidene acetone	0·5 gram
Coumarin	4 grams
Isobutyl salicylate	1 gram
Musk ambrette	1 „
Benzoin R.	3 grams

Ammonia Cream (Soft).

Stearic acid	200 grams
Benzoinated lard	20 „
Strong solution of ammonia ·880	10 c.c.
Distilled water	770 „
Linalol	5 „
Terpineol	3 „
Ylang-ylang oil	2 „
Floranal	4 grams
Oakmoss resin	1 gram

Add the ammonia to the hot water, stir, and pour the solution rapidly into the melted fats, triturating briskly all the time.

Borax and Soda Cream (Soapy).

Stearic acid	130 grams
Borax crystals	58 „
Sodium carbonate crystals	12 „
Water	800 c.c.
Glycerine	50 „
Rose-geranium oil	9 „
Patchouli oil	1 „

Pour the melted stearin into the boiling solution of glycerine, water, borax, and soda. Continue to boil until the mixture gelatinises. Cool and add the perfume.

Witch Hazel Foams are made on the same lines as vanishing creams, excepting that a proportion of the water is replaced by distilled extract of witch hazel, which is added to the already saponified fatty acid :—

Stearic acid	180 grams
Potassium hydroxide	12 „
Water	260 c.c.
Distilled solution of witch hazel	500 „
Glycerine	50 „

Perfume with rose otto if desired.

Peroxide Creams contain hydrogen peroxide at the time of manufacture, but it seems doubtful if this exists as such when they are used :—

Stearic acid	120 grams
Lanolin anhydrous	20 ,,
Borax	30 ,,
Glycerine	100 c.c.
Water	700 ,,
Hydrogen peroxide—20 volumes	50 ,,
Benzyl propionate	2 ,,
Bois de rose oil	3 ,,
Styrax R.	1 ,,

Add the H_2O_2 while the cream is cooling.

Lanolin Creams make an excellent skin emollient. They generally consist of hydrous lanolin to which has been added a fixed oil and some glycerine. They should be well perfumed :—

Lanolin hydrous	800 grams
Almond oil	100 ,,
Glycerine	100 ,,
Benzoic acid	2 ,,
Coumarin	5 ,,
Musk ambrette	1 gram
Linalol	2 c.c.
Terpineol	3 ,,
Bergamot oil—terpeneless	2 ,,
Cistus R.—colourless	1 ,,
Amber liquid	4 ,,

Melt the lanolin on a water bath and add the oils and glycerine. Stir until of uniform consistency, and when cool add the perfumes which had been previously mixed.

These products may be filled into tubes by the apparatus described and illustrated on page 346. They are often labelled *Toilet Lanolin.*

Tragacanth Skin Creams are made with gum tragacanth, glycerine, and water suitably perfumed. Here is an example :—

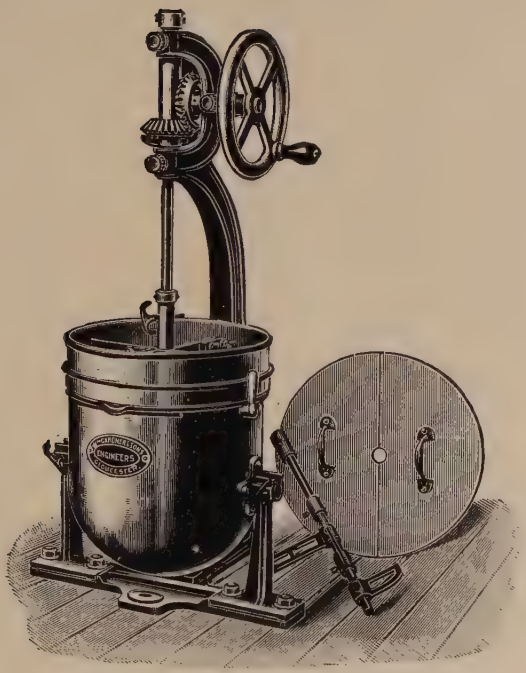

FIG. 63.—Machine suitable for the Manufacture of Skin Creams. It may be power driven and fitted with a steam jacket if desired.

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Powdered tragacanth—white	20	grams
Rectified spirit	50	c.c.
Glycerine	200	,,
Water	730	,,
Hydroxy—citronellal	1	,,
Vetivert oil	0·5	,,
Jasmin synthetic	2	,,
Rose synthetic	2	,,
Iso-butyl benzoate	1	,,
Tolu R.	4	,,

Rub down the tragacanth with the spirit and the perfumes in a mortar, add the glycerine. Triturate briskly and add the water in one continuous stream. If any lumpiness occurs, stand aside overnight and then pass through muslin.

Benzoin Creams are similar to the above, and part of the alcohol is replaced with tincture of benzoin. A whiter cream results. Here is a formula :—

Tragacanth	16	grams
Tincture of benzoin	10	c.c.
Alcohol	40	,,
Rose synthetic	5	,,
Violet synthetic	2	,,
Glycerine	100	,,
Water	840	,,

Proceed as above.

Liquid Benzoin Creams may be prepared in this way —using much less tragacanth—as follows :—

Tragacanth powdered No. 1	8	grams
Tincture of benzoin 1 in 5	20	c.c.
Glycerine	100	,,
Tincture of orris	20	,,
Opoponax otto	2	,,
Water	850	,,

Proceed as above.

Virginal Milk is a similar preparation made *without* tragacanth.

Simple Form.

Tincture of benzoin	25	c.c.
Glycerine of borax	50	,,
Rose water—to produce	1000	,,

Compound Form.

Tincture of benzoin	20 c.c.
Tincture of tolu	5 „
Tincture of storax	5 „
Tincture of ambergris	10 „
Tincture of musk	10 „
Jasmin absolute	2 „
Glycerine of borax	50 „
Water	900 „

Mix the tinctures with the glycerine and add the water gradually. Shake and pass through glass wool.

Almond Creams are very fine emulsions of wax and almond oil. Some are prepared direct from sweet almonds, others are made by using the expressed oil. The former type give better results :—

Take

Cetaceum	10 grams
White wax	10 „

and melt on a water bath. Add

Powdered Castile soap	15 „

In the meantime reduce to a coarse powder

Blanched almonds	100 „

Place this in a warmed mortar and add the soap and wax mixture. Triturate until a smooth paste is obtained. Add to this very gradually, stirring briskly the whole time,

Glycerine	100 c.c.
Warm water	500 „

Pass the cream so obtained through linen. Scrape off the deposit and transfer again to the mortar. Triturate it with

Warm water	200 c.c.

and again pass the solution through linen. Discard the residue.

Gradually shake into this emulsion the following mixture :—

Salicylic acid	0·5 gram
Methyl paratolyl ketone	0·5 c.c.
Rose-geranium oil	4 „
Tincture of benzoin	100 „
Tragacanth	1 gram
Rectified spirit	100 c.c.

Then add

Water—to produce . . .	1000 c.c.

Pass the emulsion through linen again and do not use any pressure, *i.e.* avoid squeezing.

The product should be shaken at intervals and after twenty-four hours a beautiful white cream will result. The perfume can be varied if desired, but methyl paratolyl ketone gives more pleasing results than benzaldehyde.

The presence of the rather large proportion of alcohol is desirable, as by its evaporation it produces a pleasant, cooling effect.

Glycerine and Cucumber Creams sometimes contain cucumber juice, but more frequently this is conspicuous by its absence. For those who wish to include it in their formula the following method of preparation is recommended :—

Take 1 kilo of cucumbers, wash them and cut them into small pieces, place these in a tincture press and squeeze out all the juice.

Heat this on a water bath for ten minutes in order to coagulate albuminous matter. Filter and cool. Stand the container in cold water for one hour and filter again. Add sufficient alcohol 90 per cent to produce 1 litre, stand aside for three days and filter bright. This constitutes *cucumber juice*, and it can be stored without alteration for some time. If desired add 1 per cent of it to the following formula for the cream :—

Almond oil	50 c.c.
White wax	10 grams
Spermaceti	20 „

Melt these together on a water bath and add the following solution in one continuous stream, stirring briskly the whole time :—

Borax	3 grams
Curd soap	25 „
Hot water	700 c.c.

Continue to stir this emulsion until it is cold. Then pour it on to the following mixture, agitating briskly :—

Tincture of orris	50 c.c.
Ionone alpha	1 ,,
Santalwood oil	2 ,,
Ylang-ylang oil	2 ,,
Violet leaves absolute	0·1 ,,
Tragacanth	2 grams
Salicylic acid	1 gram

Make up to 1 litre with water and pass through muslin.

This formula may also be employed for **Lait d'Iris** or for **Honey** and **Almond Cream** if 1 per cent of honey is added and the perfume materials substituted as below :—

Rose otto	2 c.c.
Verbena oil	1 ,,
Citronellol	1 ,,
Olibanum R.	1 ,,

Milk of Roses may be made to the above formula, the only difference being that the perfume consists of Grasse rose-geranium oil.

Lotions sold as *complexion beautifiers* frequently contain small quantities of mercuric chloride. They are generally packed as opalescent or even milky solutions. The former type is prepared as follows :—

Mercuric chloride	2 grams
Tincture of orris	5 c.c.
Tincture of benzoin	3 ,,
Eau de Cologne	100 ,,
Rose water—to produce	1000 ,,

Dissolve the mercuric chloride in the tinctures and eau de Cologne and then add the water.

The latter type is prepared from almonds as follows :—

Powdered almonds	100 grams
Powdered soap	5 ,,
Water	600 c.c.

Triturate the powders with the water and strain through linen.

Add

Glycerine of borax	50 c.c.
Mercuric chloride	1 gram
Lavender water	50 c.c.
Water—to produce	1000 „

Dissolve the mercuric chloride in the lavender water.

Note.—These products are poisonous.

Buttermilk Lotions are made with *lactic acid* as follows :—

Lactic acid, *syrupy*	5 c.c.
Glycerine	100 „
Tincture of benzoin	10 „
Tincture of styrax	10 „
Patchouli R.	1 „
Rose synthetic, extra	4 „
Rose water—to produce	1000 „

Dissolve the perfumes in the tinctures and add to the glycerine. Shake with 800 c.c. of water and then add the acid. Make up to volume with more rose water.

Bleaching Lotions are generally prepared with hydrogen peroxide as follows :—

Hydrogen peroxide 10 vols.	100 c.c.
Tincture of benzoin	10 „
Muguet synthetic	5 „
Rose water—to produce	1000 „

Freckle Applications are made both as lotions and creams. The former are more generally used and contain either ammonium chloride, mercuric chloride, zinc sulphocarbolate, or potassium carbonate.

Here is a suitable formula :—

Ammonium chloride	10 grams
Glycerine	40 c.c.
Alcohol	100 „
Liquor carmine	1 „
Mimosa synthetic	2 „
Amber liquid	2 „
Rose water—to produce	1000 „

Here is another :—

Zinc sulphocarbolate	8 grams
Glycerine acid boric	20 c.c.
Lavender water	90 „
Tincture of benzoin	10 „
Water—to produce	1000 „

Tint if desired with liquor carmine.

Sunburn Lotions generally contain one or more of the following :—

Zinc oxide, hydroxide, or sulphocarbolate.
Calamine.
Glycerine.

Sometimes tinctures of benzoin or tolu are added, but the protection of the skin is effected by the above. The powders are rubbed to a smooth paste with the glycerine and then diluted to volume. The suspension is passed through fine muslin and then bottled. Care must be taken that the insoluble powders are evenly distributed throughout all the containers. The products are usually sent out pink, and when calamine is not used the colour should be obtained with a pigment rather than a dyestuff. Here are some formulæ :—

A.

Zinc oxide	20 grams
Calamine	100 „
Zinc sulphocarbolate	30 „
Tincture of orris	50 c.c.
Glycerine	50 „
Violet synthetic	1 „
Water—to produce	1000 „

B.

Zinc hydroxide (25 per cent solution)	100 grams
Zinc carbonate	70 „
Corn starch	30 „
Glycerine of borax	50 c.c.
Tincture of benzoin	50 „
Benzyl cinnamate	2 grams
Heliotropin	5 „
Tuberose absolute	1 gram
Water—to produce	1000 c.c.

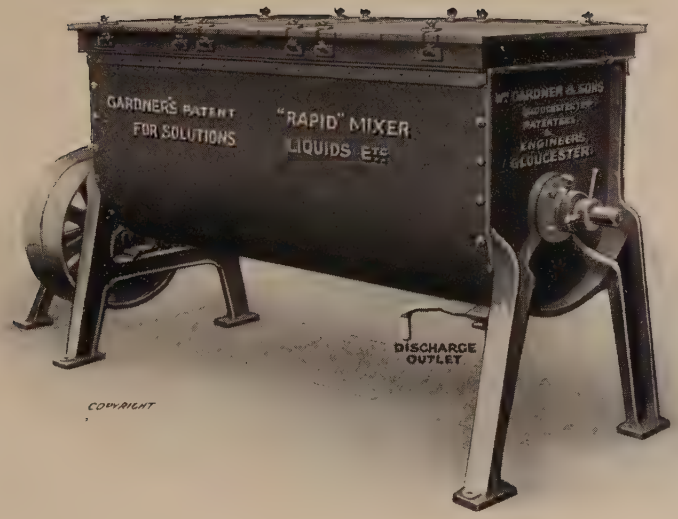

Fig. 64.—Type of machine used in the preparation of Liquid Face Powders, Sunburn Lotions, etc.

The agitator is of special construction and revolves in liquid-tight bearings, keeping all the ingredients in motion and suspension.

The contents may be discharged into separate containers, when each will have an equal distribution of the insoluble constituents.

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Dissolve the perfumes in the tincture of benzoin. Tint the powders with Armenian bole if desired.

Note.—Zinc hydroxide is prepared from zinc sulphate by precipitating a 5 per cent solution with excess of ammonia and washing the precipitate until free from sulphates. Add an equal weight of glycerine and sufficient water to make a 25 per cent solution.

Liquid Face Powders are made on similar lines to the above, excepting that *Bismuth oxychloride* is included instead of calamine or zinc sulphocarbolate. Some starch should always be present, as it improves the effect produced and helps to suspend the heavier insoluble constituents.

Some formulæ are given :—

White.

Zinc oxide	50	grams
Bismuth oxychloride	50	„
Corn starch	50	„
Glycerine	100	c.c.
Orange flower water	750	„

Rub down the powders, add the mixed glycerine and water gradually, and pass through fine muslin.

Naturelle.

Bismuth subnitrate	50	grams
Zinc hydroxide	50	„
Corn starch	50	„
Glycerine	150	c.c.
Eau de Cologne	100	„
Armenian bole	1·5	gram
Burnt sienna	0·5	„
Water	600	c.c.

Rub down the pigments in a mortar with the bismuth subnitrate and sift through 200 mesh silk, then proceed as above.

Note.—For other colours see *Face Powders*.

Glycerine Jellies are made with gelatine, but it is imperative that this should be water white and quite odourless. *Two* per cent of such a product dissolved in warm water should set to a jelly when cold, so that the consistency of any product can be based on the percentage used in comparison with this figure :—

Gelatine	30 grams
Glycerine	170 c.c.
Orange flower water—triple	800 „

Place the gelatine in 500 c.c. of water and stand overnight. Then warm until solution has been effected. Add the glycerine and the remainder of the water and run into pots.

These products may be coloured if desired. The following will make an excellent cooling application :—

Gelatine	25 grams
Glycerine of borax	500 c.c.
Alcohol	10 „
Menthol	1 gram
Phenylacetic acid	1 „
Triple rose water	500 c.c.

Proceed as above, dissolve the perfumes in the alcohol, and add when the solution has cooled.

Camphor Ice contains from 10 to 25 per cent of camphor, which is added to the melted fats when they have cooled. It is then poured into moulds and the blocks wrapped in tinfoil :—

Camphor flowers	150 grams
Ceresine—white	50 „
Hard paraffin	250 „
Soft paraffin—white	550 „

CHAPTER VII.

SMELLING SALTS.

1. Suitable bases.
2. Ammonia smelling salts.
3. Perfumes.
4. Anticatarrhal salts.
5. Acid smelling salts.
6. Toilet vinegars.

SMELLING salts are of two distinct kinds, *i.e.* those having an alkaline reaction and consisting of ammonia in some form or another; those having an acid reaction and consisting mainly of glacial acetic acid. The principal difficulty attendant upon the putting up of these articles is that of fluidity, and since many of them are frequently carried in the pocket or handbag, any danger of their escaping from the vessel containing them must be overcome, and will receive our first consideration. It may seem superfluous to draw attention to the necessity of a perfectly fitting stopper in the glass container, but in many cases this will eliminate most of the trouble, while at the same time it prevents the rapid evaporation and loss of the active constituent. This, therefore, is of prime importance, and a good practice consists of the application of a little soft paraffin to the stopper, which has a nasty habit of sticking, especially in the ammonia type of salt, and is overcome by this preliminary operation. The ideal type of smelling salt consists of a dry powder—at most only moistened, when any possibility of leakage is at once eliminated. Any of the inodorous and insoluble inorganic bodies may be used for this purpose; among them may be mentioned kieselguhr, calcium phosphate, kaolin, asbestos, pumice, glass, barium

sulphate, etc. Others, only slightly soluble (in ammonia or acetic acid) are prunella balls (potassium nitrate), potassium sulphate crystals, etc. Pieces of sponge are often used, but eventually they become unsightly and are not recommended. Very pretty effects are obtained by colouring the above bodies, and for this purpose many of the dyestuffs enumerated under that heading in the dictionary are useful.

Ammonia Smelling Salts are most common in Britain, and one of the most effective forms is that known as *Prestons*. It consists of intimately mixing a fairly stable ammonium salt, such as the chloride, with an alkaline carbonate, or freshly slaked lime. The ammonia is liberated slowly and the salt will last for years. Two formulæ are appended :—

A.

Ammonium chloride . . .	700 grams
Slaked lime	300 „

B.

Ammonium chloride . . .	600 grams
Potassium carbonate . . .	400 „

Another excellent solid form is that known as ammonium monocarbonate. It is made by adding strong liquid ammonia to freshly powdered carbonate of ammonia (a mixture of bicarbonate and carbamate), and placing the wet mass in a hermetically sealed vessel until the solid monocarbonate has been formed. This is reduced to coarse powder and is then ready for perfuming :—

Ammonium carbonate . . .	700 grams
Strong solution of ammonia 0·880 .	300 „

This method is not always adopted before filling the bottles—many manufacturers prefer to place the small lumps of ammonium carbonate in the vessel and then moisten with the liquid ammonia, previously perfumed and containing alcohol ; the mass eventually solidifies and is practically inexhaustible.

Other methods consist of moistening any of the above insoluble bodies with liquid ammonia, or adding it, coloured and perfumed, to glass beads, prunella balls, etc. The latter type remains liquid and requires frequent renewal, since the NH_3 is rapidly lost.

Perfumes.—The commonest form is lavender, but mixtures of rose, bergamot, cloves, cinnamon, nutmeg, and musk are useful. The oils are dissolved in alcohol and then added to the ammonia as follows :—

Lavender.

Lavender oil—French	50 c.c.
Bergamot oil	10 „
Rosemary oil	5 „
Musk extract soluble 10 per cent	1 „
Alcohol 90 per cent	200 „
Strong solution of ammonia	800 „

Lavender "de luxe."

Lavender oil—English	60 c.c.
Rose oil—Bulgarian	5 „
Bergamot oil	40 „
Clary sage oil	1 „
Cinnamon oil	6 „
Clove oil	8 „
Amber liquid	10 „
Alcohol 90 per cent	250 „
Strong solution of ammonia	750 „

Rose.

Rose-geranium oil—Grasse	35 c.c.
Rose oil—Provence	10 „
Patchouli oil	1 „
Musk extract soluble 10 per cent	4 „
Alcohol 90 per cent	300 „
Liquid ammonia ·880	700 „

Anticatarrhal Salts are made as above described, but contain camphor, terebene, eucalyptol, phenol, pine oil, iodine, etc. They may be prepared with ammonium carbonate as follows :—

Terebene	40 grams
Camphor	40 „
Phenol	80 „
Eucalyptol	20 „
Iodine	20 „
Ammonium carbonate	700 „
Liquid ammonia ·880	100 c.c.

Rub together in a mortar and fill loosely into bottles. Place some glass wool in the neck to prevent the contents falling out.

Acid Smelling Salts are made with glacial acetic acid 98-99 per cent, generally coloured with either Congo red or some acid dyestuff. A good method consists of filling the bottle with small pieces of *asbestos*, pouring on the perfumed and coloured acid, and then inverting the bottle to allow any excess to drain off. Kieselguhr or potassium sulphate crystals may replace asbestos, when a wad of glass wool should be placed on the top to prevent the contents falling out. Add the acid solution and drain as above. The solutions are made as follows :—

Lavender.

Camphor	100 grams
Cochineal in powder	10 „
Lavender oil—French	30 „
Bergamot oil	15 „
Nutmeg oil	5 „
Acid acetic glacial	840 „

Violet.

Bergamot oil	50 grams
Orris oil—concrete	10 „
Ionone beta	70 „
Santalwood oil	20 „
Naphthol green	1 gram
Acid acetic glacial	850 „

Toilet Vinegars are considered to have unusually good refreshing properties and in many cases are nothing more than *Toilet Waters* to which has been added glacial acetic acid and/or acetic ether. Any perfume may be used, and some examples are appended :—

Cologne Toilet Vinegar.

Neroli oil	3 c.c.
Petitgrain oil—French	3 „
Bergamot oil	5 „
Lemon oil	3 „
Lavender oil	1 „
Acetic ether	60 „
Glacial acetic acid	200 „
Alcohol 75 per cent	740 „

Lavender.

Lavender oil—Mont Blanc	10 c.c.
Bergamot oil	5 „
Clary sage oil	0·5 „
Musk extract soluble 10 per cent	1 „
Glacial acetic acid	400 „
Alcohol 90 per cent	600 „

Violet.

Ionone 100 per cent	18 c.c.
Orris oil—liquid	2 „
Bergamot oil—terpeneless	5 „
Santalol	5 „
Violettophyx	5 „
Aether acetic	115 „
Alcohol 80 per cent	850 „

Millefleurs.

Lime oil	5 c.c.
Bergamot oil	20 „
Clove oil	6 „
Cinnamon oil	2 „
Jasmin synthetic	100 „
Rose synthetic	50 „
Neroli synthetic	17 „
Amber liquid	25 „
Ether acetic	15 „
Acid acetic glacial	60 „
Alcohol 90 per cent	700 „

CHAPTER VIII

THEATRICAL REQUISITES

1. Introduction.
2. Grease paints, general qualifications, fat base, dry base.
3. White grease paint, coloured grease paint.
4. Colours and descriptive list.
5. Flesh tints, blacks, blues, carmines, rose.
6. Eyebrow pencils.
7. Theatrical face powder.
8. Theatrical cold cream.
9. Grease paint remover.
10. Wet white.
11. Rouge—colours, naturelle, brunette, framboise, theatre, liquid rouges.
12. Kohol.
13. Gold and silver paints.
14. Luminous paints.

THE stage without make-up would be as lifeless as the photograph of a beautiful painting. The natural colouring of the artist, however beautiful, is neutralised by the actinic brilliance of the footlights, and the result would be a picture at once drab and uninteresting. This bleaching influence of the limelight is corrected by the use of grease paints, which are made in any colour from the palest of fleshes to the deepest of blues, blacks, etc.

While the question of *tint* is an important one, first consideration will be given to those other qualifications which are the hall mark of a good product. A grease paint should—

1. Spread well.
2. Not be fatty.
3. Not become unnecessarily hard on keeping.
4. Have maximum covering power.
5. Not be gritty.

The first three points will be referred to under *Fat* base and the second two under *Dry* base.

Fat Base.—The normal temperature of the blood is 37° C. and the melting-point of the fat base must therefore be above this in order that it may spread well, and yet it must not be too high or it will not answer these requirements. If, on the other hand, the melting-point is below 37° it will become fatty after application, and the result will be an unsightly mess which will necessitate the continuous use of powder. The list of materials from which the fat base may be compounded is a wide one and includes :—

(*a*) Almond or peach kernel oil and liquid paraffin.
(*b*) Soft paraffin, suet, lanolin, lard, or tallow.
(*c*) Hard paraffin, ceresine, or beeswax.

All these materials are good, with the exception of lard, suet, and tallow, which, however, are used in very cheap products. Grease paints containing them possess the disadvantage of turning rancid after some months. All theatrical paints must be sufficiently "tacky" to make the powder adhere perfectly after they are applied, and on this account either white wax or lanolin is used in most formulæ. The quantity varies according to the amount of "tack" desired, but 10 per cent of either or both should not be exceeded. The *perfume* is generally added to the fat base, and a synthetic is preferable. The following are good : Dimethyl hydroquinone, coumarin, heliotropin, musk ketone, benzylidene acetone, diphenyl methane, phenyl-cresyl oxide, patchouli, and vetivert.

The fats are melted together in an enamelled pan, strained, and the perfume added when cool. Formulæ follow :—

A.

Ceresine white	250 grams
Lanolin anhydrous	50 „
Paraffin liquid 0·860	700 „
Dimethyl hydroquinone	1 gram
Vetivert oil—Bourbon	1 c.c.

B.

White wax	60 grams
Peach kernel oil	340 „
Soft paraffin—white	300 „
Hard paraffin	300 „
Coumarin	1 gram
Musk ketone	1 „
Patchouli oil—English	0·5 c.c.

Dry Base.—There are numerous raw materials from which the dry base may be selected, and among the more important bodies possessing remarkable covering power are : Zinc oxide, bismuth subnitrate, precipitated chalk, kaolin, and kieselguhr.

The first is excellent ; the second is expensive and not often used, excepting for *white ;* the third is good, but not quite so smooth as the first ; the fourth and fifth are cheap and make a very useful addition to the latter. In order to assist the "slip" French chalk is sometimes added up to about 10 per cent. The powders should be very finely ground and then passed through a sifting and mixing machine. Suitable combinations are given :—

A.

Zinc oxide	800 grams
Precipitated chalk—light	100 „
Kieselguhr	100 „

B.

Zinc oxide	750 grams
Kaolin	50 „
Precipitated chalk—heavy	200 „

C.

Zinc oxide	700 grams
Bismuth subnitrate	200 „
Talc	100 „

White Grease Paint (No. 20) is made by mixing together suitable proportions of fat and dry base. These are :—

Dry base (containing bismuth)	550 grams
Fat base	450 „

Soften the fat base by the aid of gentle heat, add the powder, and then pass through a paint mill to ensure a perfectly fine product. When such machinery is not available mix the two bases in a steam pan, and pass the whole, while liquid, through muslin or, for preference, through 90 mesh silk. Run the cream into moulds, making sticks about 4 inches long, and wrap them in tinfoil, cellophane, or greaseproof paper.

Coloured Grease Paints are made by triturating the pigment with the dry base, which after perfect mixation is added to the fat base, and the whole is then treated as above described. Any of the dry bases may be used, excepting where otherwise stated, as, for example, in *black*.

Colours.—Theatrical paints are made in a variety of colours, and for the sake of completeness a fairly representative list of them is given. They are sold by *number*, and this should therefore appear on the label attached to each stick :—

1. Very pale flesh (lady).
1½. Moderately pale (lady).
2. Fair complexion (youth).
2½. Medium flesh (young man).
3. Pale complexion (man 30-36).
3½. Slightly sunburnt.
4. Dark flesh (sailor).
4½. Very dark flesh (brigand).
5. Sallow (Chinese).
5½. Dark sallow.
6. Yellowish flesh (old man).
6½. Japanese.
7. Brown.
8. Armenian bole.
9. Sunburnt (Indian).
10. Light brown (opera Aïda).
11. Burnt umber (Othello).
12. Black (negro).
13. Red-brown (mulatto).
14. Chocolate (North African).
15. Brick-red (East Indian).
16. Dark brown (gipsy).
17. Joining paste—light.
18. Joining paste—dark.
19. Light chocolate.
20. White (clown).
Rose.
Dark rose.
Carmine vermilion.
„ I (light).
„ II (medium).
„ III (dark).

Other colours are :—

Light, medium, and dark blue.
„ „ „ „ grey.
„ „ „ „ old red.
Citron, chrome, and orange.

Those paints required for a juvenile make-up are in greatest demand, and their tinting will in consequence be treated in detail. The names given to the other colours will be sufficient to enable the operator to quickly obtain the desired tint by experiment.

Flesh Tints, up to and including No. 3, are obtained by the use of vermilion, of which there are three shades, *i.e.* *extra pale*, *pale*, and *deep*.

A. For *salmon* effects they are mixed as follows :—

Deep vermilion	1 part
Pale „	7 parts

B. For *pinky* effects :—

Deep vermilion	2 parts
Pale „	6 „

The pigments should be levigated very finely with the dry base before incorporating the fats.

Tints No. 1, 1½, and 2 are very pale, while No. 2½ and 3 are much deeper. To every 1000 grams of *dry* base add :—

For No. 1	5 grams of B	
„ „ 1½	10	„ „ „
„ „ 2	20	„ „ „
„ „ 2½	50	„ „ A
„ „ 3	80	„ „ „

Flesh Tints from 3½ upwards are made with or without vermilion plus other pigments.

No. 3½ is a brownish-red colour for sunburnt effects, and to every 1000 grams of *dry* base add :—

Deep vermilion	250 grams
Orange chrome	50 „
Burnt sienna	50 „

No. 4 is more yellow, and is tinted with :—

Deep vermilion	80 grams
Golden ochre, No 1	120 „
Rouge (anhydrous Fe_2O_3)	80 „

No. 5 is yellowish, and is obtained with :—

Golden ochre, No. 1	30 grams
Orange chrome	20 „
Rouge	2·5 „

No. 6 is redder than No. 5, as follows :—

Golden ochre	30 grams
Orange chrome	20 „
Rouge	60 „
Pale vermilion	10 „

Blacks are obtained with either drop or lamp black, and no dry base is necessary.

Soft kinds for ordinary use are made as follows :—

Finely ground drop black	200 grams
Fat base	800 „

Hard kinds are obtained with :—

Lamp black	180 grams
Hard paraffin	400 „
Soft paraffin	420 „

This is made harder, so that when melted and deftly applied to the eyelashes, it will rapidly solidify. With practice the lashes can therefore be increased to any desired length.

Blues.—There are three—light, middle, and dark—used for shading the eyes, etc. They are obtained by adding to the dry base varying proportions of either ultramarine, Chinese blue, or cobalt blue. Some of the blue lakes are good, and for violet shades mixtures of cobalt blue and mauve lake are recommended.

Carmines.—There are four : 1, 2, 3, and carmine vermilion, No. 3 being the deepest tint. This is made to the following formula :—

Carmine No. 40, in fine powder	200 grams
Zinc oxide	100 „
Ceresine	200 „
Soft paraffin	500 „

No. 2 is made as follows, and No. 1 can be obtained by the further dilution of the colour with dry base. The addition of vermilion should be noted :—

Carmine No. 40, in fine powder	50 grams
Vermilion—extra pale	50 „
Dry base	100 „
Ceresine	250 „
Soft paraffin—white	550 „

Rose.—There are two shades, and the colour is arrived at by the use of madder lake and vermilion. A formula is given for the dark shade, and the lighter one can be obtained by using half the quantity of pigments :—

Madder lake	20 grams
Deep vermilion	20 „
Fat base	460 „
Dry base	500 „

Eyebrow Pencils are prepared in two colours, black and brown. They are generally made fairly hard, and moulded in thin pointed sticks. A formula for brown follows :—

Burnt sienna	80 grams
Burnt umber	100 „
Hard paraffin	420 „
Soft paraffin—yellow	400 „

Face Powders are often made in cheaper grades for the stage, and as the grease paint is adherent, such ingredients as zinc stearate (mentioned in the chapter on Toilet Powders) are omitted.

Arrowroot, unperfumed, is sometimes employed, but such examples as follow are in more common use :—

A.

Kaolin	200 grams
Precipitated chalk—light	200 „
Starch—maize	300 „
Zinc oxide	300 „
Violet synthetic	3 c.c.

B.

Zinc oxide	400 grams
Kieselguhr	300 ,,
Orris-root powder	100 ,,
French chalk	200 ,,
Rose synthetic	2 c.c.
Patchouli oil	0·5 ,,

C.

Maize starch	400 grams
French chalk	100 ,,
Zinc oxide	500 ,,
Amber liquid	2 c.c.
Jasmin extra	1 ,,

All the above should be passed through a sifting and mixing machine (for details *see* page 428).

Theatrical Cold Cream is generally distinct from the ordinary preparation which is described elsewhere. Lard forms a cheap base, and is sometimes supplemented by additions of cocoa butter, spermaceti, or ceresine :—

A.

Benzoated lard	1000 grams
Geranium oil—Bourbon	5 c.c.

B.

Lard	800 grams
Cocoa butter	200 ,,
Lavender oil—French	5 c.c.

Grease Paint Remover is employed in the form of short sticks, and consists principally of cocoa butter. Other types are made as follows :—

Ceresine	375 grams
Soft paraffin—white	620 ,,
Verbena oil	3 c.c.
Olibanum R.	2 ,,

Melt the fats, cool, add the perfumes and mould. *Soft* kinds can be made as follows :—

White beeswax	50 grams
Paraffin liquid ·860	150 c.c.
Soft paraffin—white	800 grams
Benzyl acetate	1 c.c.
Neroli oil	2 „

Wet White is a theatrical requisite in great demand by the ladies who use it to whiten the neck and arms. It is known under several names, such as, *Blanche de Perle*, *French white*, etc. The basic ingredients are zinc oxide and the oxychloride, subnitrate or carbonate of bismuth. The liquid consists of a mixture of glycerine and water in varying proportions. The former is employed up to 30 per cent and the latter is often replaced by triple rose or other fragrant water. The addition of starch is desirable, as it helps to suspend the heavier ingredients. The powders are well mixed in a large mortar and the glycerine added. The water is gradually poured in to make the desired volume and the whole passed through muslin to remove grit, etc. The following formulæ yield good products :—

A.

Bismuth subnitrate	50 grams
Starch	50 „
Zinc oxide	100 „
Glycerine	150 c.c.
Rose water—to produce	1000 „

B.

Bismuth carbonate	75 grams
Zinc oxide	125 „
Glycerine	300 c.c.
Alcohol	100 „
Orange flower water—to produce	1000 „

C.

Bismuth oxychloride	50 grams
Zinc oxide	75 „
Starch	25 „
Glycerine	250 c.c.
Sylvanol	5 grams
Phenylethyl alcohol	10 c.c.
Distilled water—to produce	1000 „

The above products, after shaking, are well rubbed into the skin and allowed to dry. The result is an alabaster-like epidermis into which much life can be infused by the liberal application of a tinted powder. The pores become blocked, and it is therefore necessary to thoroughly cleanse the skin with soap and water after use. Another type of wet white is made by replacing the bismuth with either *Epsom salts* (magnesium sulphate) or *Sodium phosphate.* When applied to the skin, minute crystals are deposited in the pores, which are afterwards cleansed by hot water. Such preparations can be made as follows :—

A.

Magnesium sulphate	50 grams
Magnesium carbonate—light	50 „
Zinc oxide	50 „
Glycerine	100 c.c.
Peppermint oil	1 „
Triple rose water—to produce	1000 „

The presence of traces of peppermint oil produces a cooling effect on the skin.

B.

Sodium phosphate	100 grams
Zinc carbonate	100 „
Glycerine	100 c.c.
Lavander water	50 „
Water—to produce	1000 „

Rouge is now made in several shades, and these are obtained with the following colours :—

Carmine No. 40 Carmoisine	Rose
Geranium lake	Bright red
Eosine Erythrosine Erythrene Phloxine Phloxine P. Rose Bengal Rose Bengal 3B.	Yellowish-red to bluish-red.

For theatrical use bright colours are necessary, and the product usually takes the form of a powder or a compact. For ordinary use **Liquid Rouges** are preferable.

Examples of three popular shades in powder form are given :—

Rouge Naturelle.

Carmoisine	4 grams
Phloxine	4 „
Starch	200 „
Talc	800 „
Paramethyl tolyl ketone	1 c.c.
Vetivert oil	1 „

Dissolve the dyestuff in sufficient water (about 200) and incorporate the powder—pass through a sieve and dry. Add the perfume and resift.

Rouge Brunette.

Eosine	1 gram
Carmine No. 40	50 grams
Strong ammonia solution	a sufficient quantity
Osmose kaolin	150 grams
French chalk	800 „
Violet synthetic	4 c.c.

Rub down the carmine with ammonia until dissolved—add the kaolin. Dissolve the eosine in water and incorporate. Mix the whole with the French chalk and sift. Dry, add the perfume, and resift.

Rouge Framboise.

Eosine	2 grams
Burnt sienna	10 „
Carmine	75 „
Ammonia liquid	a sufficient quantity
Corn starch	100 grams
Kieselguhr	70 „
Talc—impalpable powder	740 „
Opoponax otto	5 c.c.

Proceed as for *Rouge Brunette*.

Rouge de Théâtre, a very brilliant colour :—

Geranium lake	100 grams
French chalk	900 „
Cassie absolute	1 c.c.
Mimosa absolute	1 „
Rose absolute	1 „

Mix and sift.

If any of the above products are required in compact form, sufficient acacia and water are added to impart the necessary adherence. The paste so obtained is moulded and allowed to dry at *normal temperatures*—(*see* Compact Face Powders, page 431).

Liquid Rouges are made from any of the colours enumerated above. The dyestuff is dissolved in water, and glycerine added. After standing aside for a week, the liquid is poured off, and the sediment (if any) discarded. Examples follow :—

A.

Erythrosine	1 to 5 grams
Glycerine	400 c.c.
Alcohol	100 „
Rose water	500 „

B.

Phloxine	1 to 3 grams
Glycerine	500 c.c.
Orange flower water	500 „

These products may be prepared with carmine as follows :—

Carmine No. 40	1 to 3 grams
Liquid ammonia 880	2 to 5 c.c.
Rose water	600 „
Glycerine	400 „

Dissolve the carmine in the liquid ammonia, add the rose water, and then the glycerine—shake.

Stand aside for one month, and decant the clear liquid.

Kohol or **Kohl** was used by the ladies of ancient Egypt for darkening their eyelashes. It was supposed to be made

at that time, from the sulphides of either lead or antimony. To-day, it is believed to be made in the East by burning together almonds, benzoin, and incense, the soot being collected and applied either in powder form or by admixture with a liquid. Other kinds are prepared in Europe by dissolving Chinese ink in a mixture of glycerine and water—the product being of a syrupy consistence. The following will make satisfactory articles, and dispense with the use of Chinese or Indian inks :—

A.

Lamp black or fine carbon black	100 grams
Powdered gum acacia	100 „
Iso-eugenol	1 c.c.
Rose water	800 „

Rub down the powders together, and add the water gradually.

B.

Ivory black or vegetable black	100 grams
Tragacanth in powder	15 „
Alcohol, 58 o.p.	135 c.c.
Orange flower water	750 „

Place the alcohol in a bottle, add the tragacanth, and shake until evenly distributed—pour in the orange-flower water, and shake until a creamy mucilage is obtained. Rub down the pigment and gradually add this mucilage to it. Pass through muslin and transfer to bottles, which should be securely corked at once.

Kohl in *paste* form is sometimes required, and may be prepared as follows :—

Ivory black	400 grams
Soft paraffin—yellow	600 „
Ionone	1 c.c.
Rose otto	1 „

Rub down the ivory black in a *warmed* mortar, and add the soft paraffin, previously liquefied. Incorporate the perfume, and transfer the pomade to small elegant pots. For use, a little should be placed on a match stick and warmed. When applied to the lashes it will set.

Gold and **Silver Paints** are made as follows :—

A.

Gold bronze	300 grams
Ceresine	200 „
Soft paraffin—white	500 „

B.

Powdered aluminium	250 grams
Ceresine	250 „
Soft paraffin—white	500 „

Melt the fats and rub down with the powder. Pour the liquid into moulds.

Luminous Paints produce a peculiar radiance in the dark or in shadow, and curious effects are obtained when they are applied around the eyes. The lithium salt and carmine are added to neutralise the greenish phosphorescent tint of the zinc :—

Zinc sulphide—phosphorescent	600 grams
Lithium carbonate	100 „
Carmine	5 „
Osmose Kaolin	300 „

CHAPTER IX.

TOILET POWDERS.

1. Face powders, types, basic substances, qualifications, adhesive properties, fineness, colours, perfumes.
2. Poudre de Riz.
3. Mineral powders.
4. Most popular types
5. Compact powders.
6. Colours—details of pigments, and dyestuffs necessary, ten principal shades described.
7. Perfumes—details of manufacture, Eastern type, fresh floral type.
8. Powder leaves.
9. Talcum powders, quality specifications.
10. Violet powders.
11. Zinc, starch, and boric powders.
12. Nursery powders.

Face Powders are now recognised as being one of woman's most indispensable toilet articles. They have, at different times, been submitted to much criticism, possibly on account of the doubtful nature of their constituents, but more probably owing to the inartistic methods of their application. To-day, they occasionally figure as the subject of a jest on the part of our newspaper correspondents, but in spite of all that has been said, they have come into their own, and are here to stay.

The reason for this is not very obscure, since the merest trace of a good face powder, properly applied, will immediately transform a shiny skin into the peach-like bloom of softest velvet. In view of this fact, few women neglect to include face powder among their most cherished toilet articles, and while some of them may not use many of the beauty aids described in this work, they will seldom,

if ever, leave their mirror to appear at any function without a finishing touch of this fascinating wonder worker.

Face powders as a class are divided into three kinds, depending largely upon the substances from which they are made. These are :—

(*a*) *Poudre de Riz*, containing a large proportion of starch.

(*b*) *Mineral powders*, containing only a small percentage of organic substances. They are usually very heavy.

(*c*) *The best kind*, consisting of the above two, combined in suitable proportions.

The substances from which these varieties may be made are :—

1. Starches—rice and maize.
2. Bismuth salts—subnitrate and oxychloride.
3. Stearates—zinc and magnesium.
4. Talcum.
5. Kaolin.
6. Kieselguhr.
7. Precipitated chalk.
8. Light magnesium carbonate.
9. Orris-root powder.
10. Zinc oxide.
11. Barium sulphate.

All these substances must be of maximum purity, and their cost should never be more than a secondary consideration.

The most necessary qualifications of a good face powder are :—

(*a*) Perfect adherence to the skin.
(*b*) Fineness of texture and even mixation.
(*c*) Colour
(*d*) Perfume.

Adhesive Properties are possessed by both zinc and magnesium stearates, kaolin, and kieselguhr, and all face powders should contain at least one of them. The premier place is undoubtedly taken by **magnesium stearate**, and it may be used up to 10 per cent. The same proportions

should not be exceeded when using *zinc* stearate, but the other two substances may be employed in any proportion according to the type of product being manufactured. All these bodies are bulky—which is a point in their favour, they are harmless, and possess very good covering powers. The stearates are even stated to have distinct therapeutic properties.

Fineness of Texture is only obtained by grinding the ingredients to a very fine state of subdivision and then putting them through silk of at least 100 mesh. For perfect results 120 is recommended, and the whole operation is easily accomplished with a modern sifting and mixing apparatus. Sifting alone has many disadvantages, because there is a tendency for the heavier constituents to pass through the silk first and the lighter ones last. If the sifted powder is not mixed, no two boxes containing it will be of the same uniform composition. The result can be easily seen, for a lady would purchase the brand twice only, and then probably start using another make. Mixing, then, is a most necessary operation, and in all modern apparatus this has been carefully attended to. Below the revolving silk drum is a rapidly rotating shaft having twisted arms which ensure a perfectly even product.

Colours are always rubbed down in a mortar with some of the ingredients before machining, and sifted twice to make sure that subdivision of the basic pigments has been accomplished. The different bodies used for this purpose will be referred to later.

Perfumes are generally added to either light magnesium carbonate or kieselguhr after they have been matured. The dry powder is resifted twice and stored. When required a known quantity is weighed out and added to the other ingredients in the mill. Another method consists of spraying the liquid perfumes on to the powder as it falls through the silk sifter. This is described in detail with the machine and spray illustrated. The amount of perfume used should

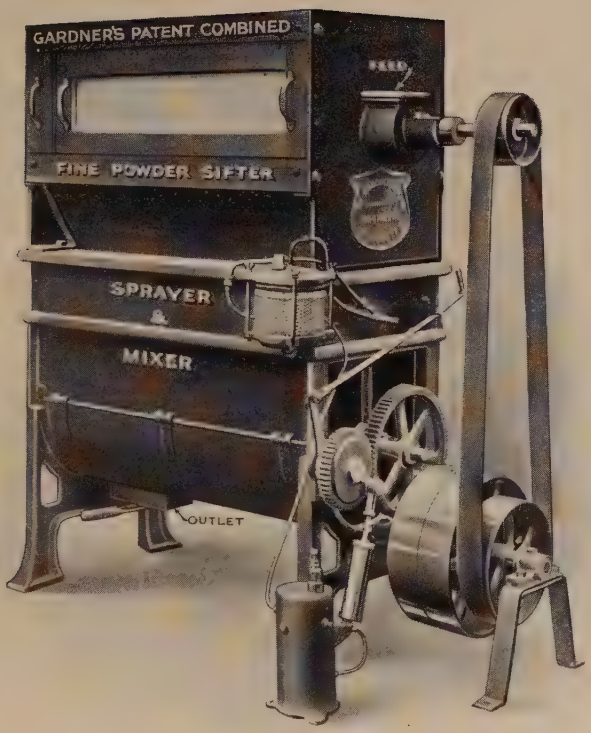

Fig. 65.—Type of machine used for the production of Face Powders, etc.

The powders are fed into the machine where indicated by means of a patent attachment, which can be adjusted either for the same or the above floor.

The powder is air-blown through a rotating cylinder of silk, the coarser particles being automatically ejected.

The sifted powders fall through the spray of perfume into the mixing chamber which is fitted with a rotating arm. This ensures perfect distribution of both perfume and colour.

The whole machine is self-contained and worked from one main driving belt.

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be reduced to a minimum, and delicate rather than strong odours are the order of the day.

Poudre de Riz of finest quality invariably contains over 50 per cent of rice starch, which for preference should be put through a 200-mesh silk before being added to the other ingredients. This is necessary as rice starch is apt to contain rather large coagulations of starch grains, and the fine sifting eliminates them. Maize starch is used in both first and second-grade products, as little as 10 per cent in the former and as much as 90 per cent in the latter. The grains are similar in shape, but about three times the size of those from rice. Some talcum is generally added to give the necessary "slip." Here are some formulæ :—

1.

Rice starch	600 grams
Maize starch	200 „
Talcum	100 „
Zinc stearate	50 „
Zinc oxide	50 „

2.

Rice starch	500 grams
Magnesium carbonate—light	250 „
Osmose kaolin	100 „
Talc	100 „
Magnesium stearate	50 „

3.

Corn starch	500 grams
Rice starch	200 „
Kieselguhr	100 „
Orris-root powder	50 „
Bismuth subnitrate	50 „
Talcum	100 „

Mineral Powders are usually very heavy and made principally for export to hot countries. Talcum is the principal constituent, and should not contain an excess of acid soluble impurities, otherwise the perfume will immediately deteriorate. Some formulæ are appended :—

4.

Talcum—extra fine	400 grams
Light precipitated chalk	300 „
Zinc oxide	100 „
Barium sulphate	100 „
Orris-root powder	100 „

5.

Kieselguhr—extra white	500 grams
Bismuth oxychloride	50 „
Heavy, precipitated chalk	100 „
French chalk	300 „
Maize starch	50 „

6.

Osmose kaolin	250 grams
Talcum	350 „
Zinc stearate	50 „
Magnesium oxide—light	150 „
Zinc oxide	100 „
Calcium carbonate	100 „

The Most Popular Powders consist of any of the above substances, judiciously combined, but all of them should contain some zinc oxide. They must be neither too heavy nor too light. Some formulæ follow :—

7.

Rice starch	400 grams
Zinc oxide	400 „
French chalk	100 „
Magnesium stearate	100 „

8.

Rice starch	300 grams
Corn starch	200 „
Bismuth oxychloride	50 „
Zinc oxide	200 „
Orris-root powder	50 „
Talcum	100 „
Zinc stearate	100 „

9.

Heavy precipitated chalk	100 grams
Magnesium carbonate	100 „
Osmose kaolin	200 „
Talcum	200 „
Rice starch	400 „

10.

Kieselguhr—extra white	200 grams
Rice starch	200 „
Maize starch	100 „
Zinc oxide	300 „
Magnesium stearate	50 „
Talcum	100 „
Calcium carbonate—light	50 „

Compact Powders now command a large sale, chiefly on account of their convenience, for they can be carried in the handbag and deftly used without any danger of spoiling the dress. As a rule they contain a fairly large percentage of talcum, but are never overloaded with starch, as this makes the compact too hard and the powder will not readily transfer to the puff. On the other hand, the presence of some starch is desirable as it has binding properties and prevents the tablet falling to powder. When starch is not employed another binding agent must be contained in the formula, and bodies such as acacia and tragacanth are used for the purpose.

Some compact powders are made by hand compression, others by moulding. A very useful machine is obtainable for the former type, when the powder must be only slightly damp. It is compressed into shallow metal trays, which form suitable bases for attaching the powder block to the bottom of the box. This reduces the risk of the compact breaking, which is one of the bugbears of this class of product. The latter type are made into a fairly damp paste, which is moulded in a glass or porcelain shallow capsule about $1\frac{1}{4}$ inches in diameter. The blocks are then dried at *normal temperature* in a current of air. If undue heat is applied they will split, and apart from this the perfume will be damaged. During the drying operation the compacts are stood on blotting paper to absorb any excess of moisture. They are afterwards stuck on to pieces of glass, which are then glued into the bottom of the container—some kinds are fastened direct into the base of the box. For cheap products, aluminium boxes are very

popular, but for best quality articles, where the perfume is to retain its freshness, there is nothing better than the ordinary, elegantly designed compressed paper or cardboard box. A small puff is generally included with the package ready for sale. Here are two formulæ for the powder :—

11.

Talcum	400 grams
Calcium carbonate	400 „
Maize starch	200 „

12.

French chalk	500 grams
Kieselguhr	100 „
Calcium carbonate	200 „
Maize starch	200 „

The Colours necessary for tinting face powder could be counted on the fingers in the days when there were only three tints, *viz.*, flesh, cream, and white. Nowadays, although *naturelle* constitutes about 60 per cent of the total sales, there is a distinct demand on the part of the fastidious for shades of powder which will help to make the *tout ensemble* one harmonious picture. The word complexion is generally held to mean the intrinsic colour of the skin, but it must be remembered that in reality this colour is influenced to no inconsiderable degree by the contrast between it and the surrounding elements such as the hair, the neck, and the frock, and also the light. Even the wearing of ornaments will modify the complexion—for example, the colour of the lips appears to become redder and more noticeable when emerald ear-rings are affected, while, on the contrary, their tint is diminished if the emeralds be replaced by rubies. It therefore becomes quite apparent that minute traces of coloured face powder will modify the appearance of the skin, and in consequence it is possible for my lady to exercise her artistic sense by the judicious choice of the tints that will enhance her personal appearance most.

In order to obtain the full range of tinted face powders

a variety of colours is necessary. Wherever possible they should be selected from the pigments described in the dictionary—care being taken that they are perfectly harmless. Many of the newer shades require the use of dyestuffs, and experiment only will determine which are best adapted for the perfumer's personal taste. The following tints can be obtained with the colours indicated :—

Cream or Rachael. Yellow ochre.

Brunette. Burnt sienna and traces of eosine solution.

Naturelle. A creamy pink should be aimed at, and it can be obtained with the colours given for brunette.

Pink. Carmine should be avoided as it produces a dirty shade. Phloxine gives a delicate clean colour.

Rose. Erythrosine, or three or four times the quantity of phloxine used for pink.

Mauresque. This is one of the newer shades, and tones well with the skin of the sunburnt maiden. It sells well in summer anywhere, and particularly at the seaside. The tint is obtained with Armenian bole and burnt sienna.

Ochre. The shade varies from a reddish-pink to a brownish-orange, and is obtained with Armenian bole and one of the orange dyestuffs. It is used by ladies whose complexions are too pale and when there is too much contrast between the colour of the face and that of the hair. The proportion of *orange* dyestuff must be *increased* when the flesh is orange-pink in colour and *reduced* if it is quite olive.

Orange. This shade is obtained with one of the orange dyestuffs or lakes. The tint should be pinkish, and this is produced by adding some eosine (traces only). It is used by anæmic ladies possessing auburn hair.

Blue. Is used for shading the eyes, and the colour is incorporated in the form of either ultramarine or cobalt blue. In either case fairly large quantities are necessary.

Mauve. This is probably the most fashionable shade to-day, and may vary from a pinkish to a violet tint. It is much used for producing an unusual pallor or toning down the reddish type of complexion—in the latter case the

minute traces of colour neutralise a part of the orange tint. It is also employed by blondes when there is an insufficient contrast between the colour of the face and that of the hair. If the skin is distinctly pinkish the *violet* mauve shade will be found most useful. The various shades are produced by combining any of the blue pigments with suitable proportions of one or other of the eosine group of dyestuffs. Very pretty and delicate violet shades can be obtained with any of the mauve lakes.

It would of course be the ideal for the toilet specialist to be also a colour artist and make up the correct shade of powder to meet the individual requirements of each client. A point which should not be lost sight of is, that different types of powder require different proportions of colour to produce identical shades, and also that the tint of a compact powder usually *appears* deeper on account of its compressed nature.

The Perfume of a good face powder is one of its most important characteristics. At one time the odour most frequently adopted was of Eastern type, but fashion is now changing, and a distinct preference is being shown for the powder having a fresh floral fragrance. In either type the presence of musk or amber liquid is essential, while in the former kind an important part is played by the essential oils of patchouli and vetivert. The lively characteristics are produced by the use of a natural extract, such as jasmin. It is customary to mature the oils and solids in a mixture of some of the resinoids, which for the purpose have been diluted with alcohol. An example of this kind of perfume is given :—

Rose absolute	50 c.c.
Jasmin absolute	20 „
Tuberose absolute	5 „
Bergamot oil—terpeneless	40 „
Heliotropin	10 grams
Diphenyl methane	20 „
Iso-butyl phenylacetate	20 c.c.
Ethyl cinnamate	5 „
Patchouli oil—English	15 „

Oakmoss resin	5 c.c.
Benzoin R.	50 „
Balsam of Peru	50 „
Amber liquid	60 „
Aldehyde C_{14} (10 per cent solution)	1 „
Alcohol	650 „

After maturing one month add the perfume to light magnesium carbonate, or kieselguhr, and when dry resift twice. Add a known quantity to the bulk powder in the mill or mixing machine. The fragrance of the resulting face powder will be very persistent.

The *spraying on* of liquid perfumes during mixation is another method which gives satisfactory results, as the uniform distribution of the scent is thereby assured.

The fresh floral type of perfume is made on the following lines :—

Mimosa absolute	20 c.c.
Rose oil—Provence	30 „
Bois-de-rose oil	25 „
Phenylacetic aldehyde	5 „
Benzylidene acetone	2 grams
Hydroxy-citronellal	50 c.c.
Dimethyl hydroquinone	7 grams
Coumarin	10 „
Vanillin	5 „
Musk ambrette	5 „
Aldehyde C_{16} (10 per cent solution)	1 c.c.
Musk extract soluble, 10 per cent	10 „
Civet extract soluble, 10 per cent	10 „
Benzoin R.	70 „
Alcohol, 90 per cent	750 „

Proceed as above.

Powder Leaves are much used as a handy application for freshening the complexion. The paper employed in their manufacture is one of the most important factors if good products are to be obtained. An unglazed absorbent tissue is best, and has often to be specially made. A standard make sometimes used is *thin superfine nature-cap.* The powder with which the paper is to be coated is mixed with water to make a thin cream.

A reasonable proportion of maize starch is usually

included in the powder, and sometimes powdered acacia is added to give the preparation additional adherence to the paper. A steady flow of the liquid powder is maintained on the rollers passing over the paper, which then runs slowly over warmed cylinders, the moisture being evaporated in the process. The dried paper is cut up into squares and made into books. A small absorbent perfumed sheet is included in the package to give it the necessary fragrance. In making **Rouge Leaves**, a similar procedure is adopted, and the powder is made up of carmine and acacia. For use, the sheets are breathed on, and the colour wiped off on cotton wool. This is then applied to the lips or cheeks as desired.

Talcum Powder is a toilet article having a very wide sale, especially in warmer countries, and is intended to allay any irritation of the skin, and at the same time to act as an efficient lubricant and preventive. In view of the fact that this type of powder generally contains a very large proportion of talc, some remarks regarding its standards of purity will not be out of place here :—

1. The primary physical characteristic is that of **Colour.** The best quality materials are *white*, second quality products are slightly *greyish-white*, and others, which should be avoided, are distinctly grey.

2. The next point to notice is that of "**Slip.**" With the possible exception of powdered boric acid, talcum is the only substance possessing in any marked degree this peculiar characteristic. Inferior qualities never exhibit the requisite amount of "slip," and since the lubricating action of this material is most necessary, nothing but the best should be purchased.

3. The last physical characteristic worthy of mention is that of **Lustre.** A good sample should be lustrous without exhibiting any undue amount of glitter. Unusual radiance is often due to the insufficient grinding or sifting of the powdered mineral, and such samples should find their way into the dust basket.

Talcum should never be bought on its physical appearance alone, but should be submitted to a chemical examination. This consists in estimating the percentage of *acid-soluble matter*. Absolutely pure talc is not obtainable since the mineral deposits contain varying amounts of impurities, consisting chiefly of iron. Any sample containing over 4 per cent of matter soluble in hydrochloric acid should be rejected. Much has been said regarding the comparative values of Italian and American talcs, but the author has examined numerous specimens and has found the former generally superior. The average sample has given the following figures :—

Italian talc	1 to 2	per cent soluble in HCl.
American talc	3 to 4	„ „ „

The absence of a large quantity of impurity is desirable, largely on account of its deleterious influence on the perfume, and to some extent owing to the irritation it may cause to the skin. In the former case, it will not only tend to alter the odour, but it often affects the colour of certain perfume ingredients. From these hints, the reader will readily appreciate the importance of the high degree of chemical purity required in a good talcum.

Many of the talcum powders sold are nothing more nor less than French chalk which has been suitably perfumed. Better products are obtained by adding boric acid, zinc stearate, etc., the talc content being about 80 per cent. The popular perfumes are violet, carnation, and rose. They should be added to magnesium carbonate, etc., as described under face powders (*which see*). Some formulæ are appended :—

Violet Talcum.

Finest Italian talc	800 grams
Powdered boracic acid	100 „
Zinc stearate	20 „
Magnesium carbonate—light	80 „
Ionone beta	1 c.c.
Orris oil—liquid	0·5 „
Heliotropin	1 gram
Violettophyx	2·5 c.c.
Ethyl myristinate	0·1 „

Carnation Talcum.

Talc	850 grams
Corn starch	70 „
Boric acid	70 „
Zinc oxide	10 „
Iso-eugenol	1 c.c.
Rhodinol	2 „
Oeilletophyx	2 „

Rose Talcum.

Talcum—extra super	900 grams
Zinc stearate	25 „
Magnesium carbonate—light	75 „
Rose absolute	2 c.c.
Iso-butyl phenylacetate	0·5 „
Citronellol	1 „
Palmarosa oil	1 „
Benzoin R.	2 „

Violet Powders consist very largely of orris-root powder, to which may be added any of the substances mentioned under face powders (*which see*). The perfume is almost invariably that of synthetic violet, which is added to fortify the inherent violet-like fragrance of the orris. Here are some formulæ :—

A.

Corn starch	200 grams
Orris-root powder	750 „
Zinc stearate	20 „
Fuller's-earth powder	30 „
Violet synthetic	2 c.c.

B.

Orris-root powder	500 grams
French chalk	300 „
Boric acid	100 „
Zinc oxide	100 „
Ionone alpha	2 c.c.
Methyl myristinate	0·5 „
Methyl heptine carbonate	0·1 „
Benzyl iso-eugenol	2·4 grams
Bergamot oil	5 c.c.

Zinc, Starch, and Boric Powders consist of mixtures of these substances, usually *unperfumed* :—

A.

Zinc oxide	100 grams
Powdered boric acid	200 „
Corn starch	700 „

B.

Powdered acid boric	100 grams
Zinc oxide	100 „
Corn starch	600 „
Rice starch	200 „

Nursery Powders are similar to the above, but generally contain some fuller's-earth and occasionally lycopodium :—

Boric acid	100 grams
Fuller's-earth	100 „
Zinc oxide	200 „
Corn starch	100 „
Orris root	200 „
Lycopodium	200 „
French chalk	100 „
Rose oil	1 c.c.
Bergamot oil	6 „
Neroli oil	2 „

APPENDIX.

1. Measures of weight—grams into avoirdupois.
2. Grams per kilo into grains per pound.
3. Grams per litre into grains, etc., per fluid ounce, pint, and gallon.
4. C.c. per litre into minims, etc., per fluid ounce, pint, and gallon.
5. Measures of capacity—c.c. into pints.
6. Conversion data.
7. Fineness of powders.
8. Alcohol conversion table.

Measures of Weight.

1 gram = the weight of 1 cubic centimetre (c.c. or mill.) of water at 4° C.
1 grain = 0·0649 gram.
1 oz. (Troy) = 31·1035 grams.
1 lb. Avoirdupois = 453·593 grams.

	Gram.	Grains.	Avoirdupois.		
Milligram . .	0·001	·0154			
Centigram .	0·01	·1543			
Decigram . .	0·1	1·5432			
Gram . .	1·0	15·4323	lb.	oz.	drams
Decagram .	10·0	154·3234	0	0	5·65
Hectogram .	100·0	1543·2348	0	3	8·5
Kilogram . .	1000·0	15432·3488	2	3	5

Grams per Kilo (parts per 1000).

Into Grains, etc., per Pound (7000 *grains*).

Grams per Kilo.	Per Pound.	
	Oz.	Grains (avoir.).
1	0	7·0
2	0	14·0
3	0	21·0
4	0	28·0
5	0	35·0
6	0	42·0
7	0	49·0
8	0	56·0
9	0	63·0
10	0	70·0
20	0	140·0
30	0	210·0
40	0	280·0
50	0	350·0
60	0	420·0
70	1	52·5
80	1	122·5
90	1	192·5
100	1	262·5
200	3	87·5
300	4	350·0
400	6	175·0
500	8	—
600	9	262·5
700	11	87·5
800	12	350·0
900	14	175·0
1000	16	—

Grams per Litre.

Into Grains, etc., per Fluid Ounce, Pint, and Gallon.

Grams per Litre.	Grains per Fluid Oz.	Grains, etc., per Pint.		Grains, etc., per Gallon.			Grams per Litre.
		Oz.	Grains.	Lb.	Oz.	Grains.	
1	0·43	0	8·75	0	0	70·0	1
2	0·87	0	17·50	0	0	140·0	2
3	1·31	0	26·25	0	0	210·0	3
4	1·75	0	35·00	0	0	280·0	4
5	2·18	0	43·75	0	0	350·0	5
6	2·62	0	52·50	0	0	420·0	6
7	3·06	0	61·25	0	1	52·5	7
8	3·50	0	70·00	0	1	122·5	8
9	3·93	0	78·75	0	1	192·5	9
10	4·37	0	87·50	0	1	262·5	10
20	8·75	0	175·00	0	3	87·5	20
30	13·12	0	262·50	0	4	350·0	30
40	17·50	0	350·00	0	6	175·0	40
50	21·87	1	0	0	8	0	50
60	26·25	1	87·50	0	9	262·5	60
70	30·62	1	175·00	0	11	87·5	70
80	35·00	1	262·50	0	12	350·0	80
90	39·37	1	350·00	0	14	175·0	90
100	43·75	2	0	1	0	0	100
200	87·50	4	0	2	0	0	200
300	131·25	6	0	3	0	0	300
400	175·00	8	0	4	0	0	400
500	218·75	10	0	5	0	0	500
600	262·50	12	0	6	0	0	600
700	306·25	14	0	7	0	0	700
800	350·00	16	0	8	0	0	800
900	393·75	18	0	9	0	0	900
1000	437·50	20	0	10	0	0	1000

C.c. per Litre.

Into Minims, etc., per Fluid Ounce, Pint, and Gallon.

C.c. per Litre.	Per Fluid Oz.	Per Pint.		Per Gallon.			C.c. per Litre.
	Minims.	Fluid Oz.	Minims.	Pints.	Fluid Oz.	Minims.	
1	0·48	0	9·6	0	0	76·8	1
2	0·96	0	19·2	0	0	153·6	2
3	1·44	0	28·8	0	0	230·4	3
4	1·92	0	38·4	0	0	307·2	4
5	2·40	0	48·0	0	0	384·0	5
6	2·88	0	57·6	0	0	460·8	6
7	3·36	0	67·2	0	1	57·6	7
8	3·84	0	76·8	0	1	134·4	8
9	4·32	0	86·4	0	1	211·6	9
10	4·80	0	96·0	0	1	288·0	10
20	9·60	0	192·0	0	3	96·0	20
30	14·40	0	288·0	0	4	384·0	30
40	19·20	0	384·0	0	6	192·0	40
50	24·00	1	0	0	8	0	50
60	28·80	1	96·0	0	9	288·0	60
70	33·60	1	192·0	0	11	96·0	70
80	38·40	1	288·0	0	12	384·0	80
90	43·20	1	384·0	0	14	192·0	90
100	48·00	2	0	0	16	0	100
200	96·00	4	0	1	12	0	200
300	144·00	6	0	2	8	0	300
400	192·00	8	0	3	4	0	400
500	240·00	10	0	4	0	0	500
600	288·00	12	0	4	16	0	600
700	336·00	14	0	5	12	0	700
800	384·00	16	0	6	8	0	800
900	432·00	18	0	7	4	0	900
1000	480·00	20	0	8	0	0	1000

Measures of Capacity.

1 litre = 1 cubic decimetre = 35·214 fluid ounces.
1 gallon = 4·54336 litres.

	Litres.	Pints.
Millilitre (c.c. or mil.) .	0·001	0·0017
Centilitre . . .	0·01	0·0176
Decilitre . . .	0·1	0·1760
Litre	1·0	1·7607
Decalitre . . .	10·0	17·6077
Hectolitre . . .	100·0	176·0773
Kilolitre . . .	1000·0	1760·7734

Conversion Data.

Grams × 15·432 = grains.
Grains × 0·0648 = grams.
Ounces × 28·349 = grams.
Pints × 567·936 = cubic centimetres.
Gallons × 4·548 = litres.
Litres × 0·22 = gallons.

$$\frac{\text{Grains per gallon}}{0{\cdot}7} = \text{parts per 100,000.}$$

Parts per 100,000 × 0·7 = grains per gallon.

$$\text{Degrees Twaddell} = \frac{1000\ (\text{Specific Gravity}) - 1000}{5}.$$

$$\text{Specific Gravity} = \frac{(\text{Degrees Twaddell} \times 5) + 1000}{1000}.$$

Fineness of Powders.

Diameter of Particles Passing through a

No. 40 mesh sieve is less than 0·38 millimetre.
„ 50 „ „ 0·28 „
„ 60 „ „ 0·23 „
„ 80 „ „ 0·17 „
„ 100 „ „ 0·14 „
„ 120 „ „ 0·12 „
„ 150 „ „ 0·09 „
„ 200 „ „ 0·07 „

Alcohol Table.

Showing the Strength of Alcohol (Percentage Absolute) with its Specific Gravity, also the Weight or Volume Required to make one Kilogram or one Litre of another Strength by the Addition of Distilled Water at 15·5° Centigrade or 60° Fahrenheit.

Strength of Absolute Alcohol.	Specific Gravity by		Quantity of Alcohol of Known Strength Required to Make 1000.									
			50 per Cent. by		60 per Cent. by		70 per Cent. by		80 per Cent. by		90 per Cent. by	
	Weight.	Volume	Weight. Grams.	Volume. C.c.	Weight. Grams.	Volume. C.c.	Weight. Grams.	Volume. C.c.	Weight. Grams.	Volume. C.c.	Weight. Grams.	Volume. C.c.
96 per cent.	0·8065	0·8125	453	520	555	625	665	730	783	833	913	935
93 „	0·8149	0·8237	474	537	582	645	697	752	820	860	956	967
90 „	0·8229	0·8339	496	555	609	666	728	777	858	888		
85 „	0·8359	0·8496	535	588	656	705	786	823	926	941		
80 „	0·8484	0·8639	578	602	709	750	849	875				
75 „	0·8605	0·8773	626	666	768	800	920	933				
70 „	0·8724	0·8900	681	701	835	852						
65 „	0·8842	0·9021	743	769	911	923						
60 „	0·8958	0·9134	815	833								
55 „	0·9072	0·9242	901	981								

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